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A JOURNEY IN THE LIBYAN DESERT

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It is probable that some portions of the depressed areas in the Libyan desert have been the scenes of human activity and habitation from very remote periods, and although existence there must always have been arduous and precarious, the human pressure in the more habitable but circumscribed regions of the Nile Valley and Delta would tend to force the weaker people thereto.

This generalization, however, perhaps expresses but one half of the incentive which forces human beings into such inhospitable regions, for it is also evident that the man of exceptional enterprise and vigor, finding his opportunities becoming few and inadequate in locations such as the Nile Valley, where every pint of available water and every foot of available land is already performing its appointed part in the sustenance of life, will also be attracted by the desert, with its vast expanses and indefinite but ever possible opportunities for exploration and adventure. Of all the arid regions in the world, the Libyan desert is one of the most inhospitable, and were it not for the few depressed areas which are rather loosely termed "oases," it would still exist as an absolute, instead of only a partial *terra incognita*.

In the course of the general study of desert conditions and of the capacity of arid regions to support life, which has been undertaken by the Desert Laboratory of the Carnegie Institution of Washington,

it has become obvious that little has been done so far in making adequate scientific comparison between the more important desert areas. The need for such comparison was the incentive which led to the organization of an expedition in the winter of 1911-1912, consisting

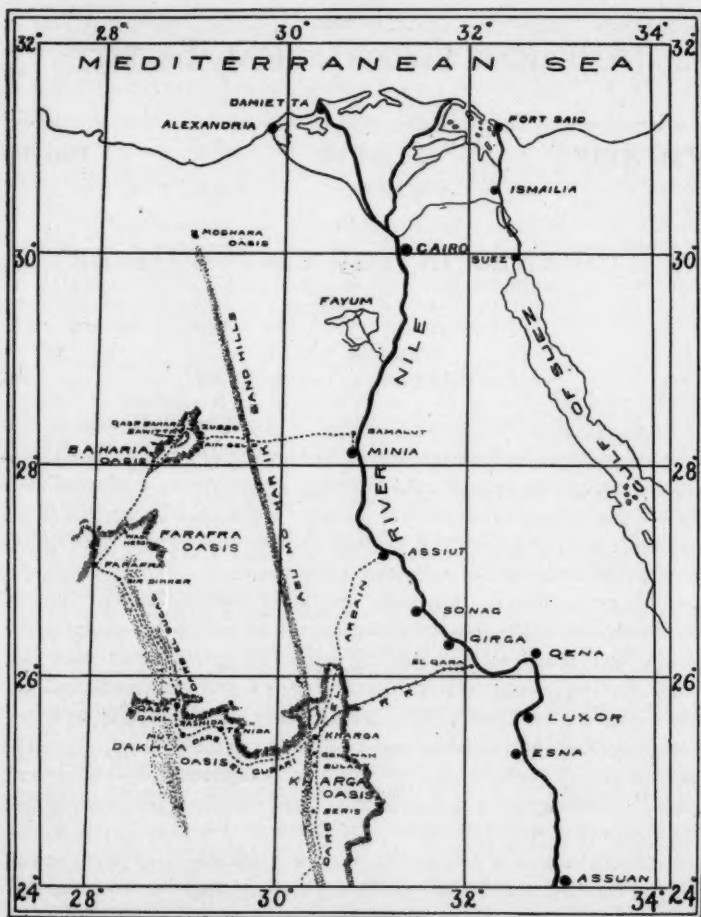


FIG. 1.—Outline Map of Egypt showing position of the "inner oases" of the Libyan desert. Compiled from official maps and personal notes by Godfrey Sykes.

of Dr. D. T. MacDougal, the Director of the Department of Botanical Research of the Institution, together with the writer, which had for its object the examination of that portion of the Libyan desert

situated between the  $25^{\circ}$  and  $29^{\circ}$  N. Lat., and extending as far West as the 28th meridian. This area contains the main Eastern Oases: Kharga, Dakhla, Farafra and Baharia, and it was hoped that the examination of these several oases, and of the caravan routes connecting them with the Nile and with each other, would afford a sufficiently comprehensive idea of the topography and general conditions of the region.

The authentic history of the Libyan Oases can be traced back as far as the XVIIIth Dynasty (1545-1350 B. C.), but is fragmentary until the Roman period, when extensive engineering works, planned for the development and conservation of the water supply, were carried out by these energetic colonizers. After the Mohammedan conquest and conversion of Egypt, there seems to have been a general neglect of all the oases, and a failure on the part of either the dwellers therein or of the rulers of the country to keep in repair or further develop the various works which the Roman conquerors had so well begun.

At all periods the remoteness and inaccessibility of these habitable areas seems to have been responsible for their use as places of banishment for political, and other offenders.

A stele discovered at Luxor, and described by Brugsch, has indicated that this had been the custom long anterior to the time of 1033 B. C.

Juvenal, the poet, and Bishop Nestorius, were both prisoners in the Great Oases, and even under the present régime a detention settlement is maintained a few miles north of Kharga, in which undesirable are forced to reside. During the Middle Ages, geographical knowledge of the Libyan desert seems to have been both scanty and faulty, and the map of Castaldi, here reproduced, will serve to illustrate the local knowledge of the cartographer of the sixteenth century. Authentic modern knowledge of the region only dates back to Cailliaud, Edmonstone, and Hoskins, who all visited it early in the Nineteenth Century, and has been added to since by Rohlfs, Schweinfurth, Lyons and others.

The Egyptian Government has also made accurate but, unfortunately, very incomplete surveys of the several oases and of some of the caravan routes, the work having been done by Ball, Beadnell and others, and the results have been embodied in various government reports, but as the work had perforce to be done somewhat hurriedly and was confined in the main to meander-surveys along the caravan routes, with some plane-table work in the vicinity of the different

villages, the maps of the region are still far from being satisfactory, and the difficulties of travel are such that it will probably be many years before our knowledge of the country is at all complete.

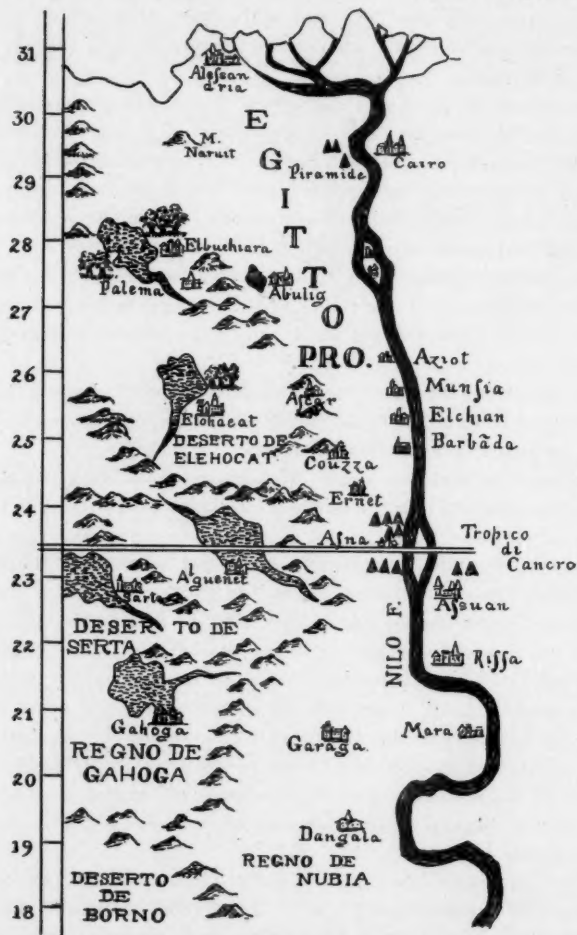


FIG. 2.—Copy of a map of 1561 in the British Museum showing the oases of the Libyan desert. (Giacomo di Castaldi Piedmontese cosmografico in Venetia. Brit. Museum, K-44, 1561.)

The earliest inhabitants of the oasis areas no doubt obtained sufficient water from springs and natural outflows, but even admitting



the existence of the lake, which Beadnell believes to have still covered the lowest part of the Kharga depression during the early period of human occupation, the available supply of water would never have proved adequate for any extended settlement, without artificial development, and it is probable that even in early Egyptian times, and certain that during the Roman occupation, artesian wells were dug or bored, and the natural supply largely augmented.

Some of the older wells which are in use to-day, no doubt date back to the Roman period, and extensive tunnels and subterranean aqueducts still exist in the different oases, and are in many places still carrying water, which are also the work of the Roman engineers.

There are evidences in many parts of the several oases, of former springs, wells and cultivated areas, now covered by drift sand or dunes. This, of course, expresses but one side of the equation of possible climatic change, inasmuch as many of the fields and groves cultivated by the present inhabitants were no doubt undeveloped in ancient times.

The most cursory examination of the wells will, however, reveal the fact that the static pressure of the underground water has in general become less, and this is no doubt largely due to the haphazard and unscientific way in which bores have been located, without any reference to the mutual interference of wells.

The inhabitants of the villages are, as a rule, singularly apathetic and unenterprising as regards water exploration and development, and Ball instances a case in his report on the Kharga Oasis (p. 57)\* in which the men of the village of Dakhakin were with difficulty induced to accompany the Survey party a few kilometers into the sand hills, where abundant water of good quality was found in several places.

This same lack of enterprise or energy is also shown by the way in which wells and cultivated areas are often allowed to drop out of use owing to a slight fall in the water level, which would seem to suggest the installation of a shaduf or saquia in order to place the water upon the land.

The use of these mechanical water-raising devices would also serve another useful purpose, in making possible the cultivation of the higher land, which is usually less impregnated with salt than the lower areas, to which cultivation has gradually been restricted owing to the steady decrease of water pressure in the wells.

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\* Kharga Oasis: Its Topography and Geology. By John Ball. 116 pp. Maps, plans, ill. *Geol. Surv. Report*, Part II, Cairo, 1900.

The unit of volume used in the estimation and measurement of the flow of water from wells and springs, is the *qirat*. Official water measurement is carried out by local officials for taxing purposes, but the system in vogue is so faulty and inexact that the *qirat* may mean anything between 125 and 250 litres flow per minute, with a general over-estimation in the case of the smaller wells and under-estimation with the larger ones.

The water of both wells and springs is generally potable and fair in quality, but is occasionally rather strongly impregnated with iron and other minerals, and in some localities, as, for instance, in the

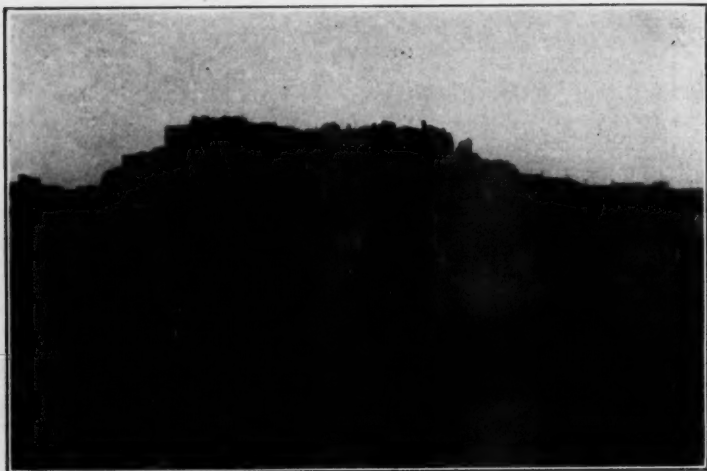


FIG. 3—The Village of Müt.

northern part of the Dakhla Oasis, it issues at quite high temperature, one well which we tested in the town of Qasr Dakhil registering  $37^{\circ}\text{C}$ .

Paucity of water supply and encroachment of drifting sand are ever present problems for the dweller in the oases, and in addition to the upkeep of his wells, conduits, and ditches, he has been obliged at all times to undertake the construction and maintenance of walls, hedges, and barriers of various kinds, in order to preserve his precious fields and groves from destruction. The movement and behavior of drifting sand is one of the most pertinent problems in desert investigation, and the Libyan desert affords many striking examples of sand distribution.

The drifting sand throughout the region assumes in general the form of long ribbons or windrows of sand, with a general direction of N.N.W. to S.S.E. which coincides with the prevailing wind. Sometimes these ribbons have become broken up into lines of detached dunes, of characteristic crescentic form, but they are in general continuous, and often persist for scores, or, in some cases, for even hundreds of miles, with sharply demarked edges, and serrated crests. A peculiar feature of many of these sand belts is their arrangement in parallel lines only a short distance apart, thus leaving a sand-free strip of ground between them. Such a lane is termed by the Arabs "Sugag" or "passage," and is taken advantage of as much as possible in traversing sandy areas.

Of the desert surfaces in general in the Libyan region, the one which comes next to the sand in evil repute is that known as the Kharafish. This consists of wind-eroded limestone, with little or no sand or soil upon its surface. Its general character may be best imagined by supposing that a short choppy sea has become suddenly solidified. It is in general further diversified by wind-eroded rocks and hummocks of various sizes, and by patches of loose sand. A rather disconcerting feature about this rough type of country lies in the fact that in spite of the size and frequency of these rough, rocky hummocks, no shelter is to be obtained behind any of them. The country has been carved by the wind, and irregularities upon the surface have in general been chiseled down to lenticular shaped masses, with their axes placed along the direction of the prevailing wind-flow.

The best desert surface to travel over is that known to the Arab as "Serir," in which the rocky framework of the country is covered with a veneer of sand and rocky fragments:—soil it can scarcely be called, as humus is almost entirely absent. The existence of such a pavement probably depends primarily upon the character of the material forming the underlying rock. If this material tends to weather into spherical form it gradually becomes triturated into sand and dust and is removed by the wind; but if, on the other hand, it weathers into small lenticular or laminated particles, it forms an ideal wind-resisting material.

A portion of our route lay across a region in which the protective paving material was composed of countless thousands of fragments of wind-worn fossil shells, all of approximately the same size and shape—nearly circular and about an inch in diameter—which formed almost a mosaic over a layer of soft loamy soil.

Several well-known and long-used caravan routes traverse the Libyan desert, touching one or more of the oases. Of these routes the Darb el Arbain (the 40 day road) is by far the most important, having constituted the main line of communication between Equatorial Africa, Darfur and Egypt, for a very long period. Its starting point in Darfur is at the town of El Fasher, in Lat.  $13^{\circ}42'$  N., Long.  $25^{\circ}20'$  E.; and its termination at Assiut on the Nile in Lat.  $27^{\circ}10'$  N., Long.  $31^{\circ}10'$  E., and so this famous and much-dreaded road passes through nearly 12 degrees of latitude and 6 of longitude.

Entering the Kharga depression at its southern end, it passes in succession the villages of Beris, Bulaq, Gennah, and Kharga, and



FIG. 4.—Panorama from housetops, Müt.

leaves the basin at its extreme northeastern angle. The crossing of the high plateau between this point and Assiut has always been deemed the most arduous part of the entire journey, for caravans. The surface is very bad; rough "kharafish" surface alternating with loose sand; and the distance between the last available water under the basin rim and the water in the Nile Valley near Assiut is nearly 150 kilometers. Cailliaud, writing in the second decade of the nineteenth century, describes a single caravan which arrived in Assiut over the Darb el Arbain, and contained over 16,000 members, including a large number of slaves;—and remarks upon the wretched condition of both human beings and beasts.

Of other routes, the Darb el Tawil, which leaves the Oasis of Dakhla at its north-east corner and runs to Beni-Adi and Manfalut, in the Nile valley, is perhaps the best known. The Darb el Gubari is one of the main routes between Kharga and Dakhla, and the Darb el Sugag is the most practicable route between Dakhla and Farafra. Several other lines of communication have been in use since very early times, between the various oases and the Nile valley.

The word "oasis," which primarily means an abiding or resting place, is perhaps somewhat of a misnomer as applied to the extensive regions in the Libyan desert, which are generally so termed. The connection, however, lies in the fact that the areas in question are



FIG. 5.—Ascending the Dakhla rim.

excavated or depressed to a sufficient depth below the general desert level to render the underground water locally accessible, and so make human habitation possible. So formidable, however, are the obstacles to travel and exploration in the Libyan regions in general, that although the oases themselves have been known and inhabited for so long a period, our knowledge of their limits is still far from complete.

The two inhabited districts of Kharga and Dakhla, which together constitute what is known as the Great Oasis, both lie below the same line of escarpment, although they are fully 120 kilometers apart, and separated by rough and barren country. The oasis of Farafra is

bounded to the west and north-west by a bold and well-defined rim, but our knowledge of its other limits is still scanty.

Baharia is a large pit-like depression with a practically unbroken wall or escarpment all around it. It has been commonly referred to as the "Lesser Oasis."

These four, together with the Oasis of Siwa, which is now most commonly and conveniently reached from the end of the Coast-line Railroad which runs west from Alexandria, constitute the most important habitable areas of this immense arid region. One more, the almost unknown Oasis of Kufra, lies far to the west, and is in reality tributary to Tripoli.

The easiest method of reaching the Great Oasis at the present time is by means of a narrow-gauge railroad which starts from the small village of El Qara, situated at the edge of cultivation in the Nile Valley, in Lat.  $26^{\circ}05' N.$ , Long.  $32^{\circ}03' E.$

The builders of the railroad have taken advantage of a long easy slope which breaks the line of the Libyan escarpment just west of this point, and have then carried the road directly across the plateau towards Kharga, reaching the edge of the depression at a distance of about 150 kilometers from El Qara. This was the route which we followed on our journey to the oases, and arrangements having already been made with the Corporation of Western Egypt, whose headquarters are at Kharga, for men, camels and camp equipment for the desert trip, we were enabled to start without delay.

In addition to ourselves, our party comprised Abu-Salem, our head camel man, and seven other men of various races, ages and degrees of desirability. Our camels were twelve in number—three riding animals, and the rest to carry baggage, water and feed. As we were thoroughly accustomed to desert travel and anxious to keep our outfit as light and portable as possible, we were unwilling to burden our camels with the tents, camp furniture, and many other conveniences pressed upon us by our Kharga friends, and we had no cause during our journey to regret our decision.

The absence of any dragoman or interpreter with our party had also been looked upon as a possible source of trouble and discomfort, as we talked no Arabic, and our men no English, but this difficulty was smoothed away by means of a small Arabic dictionary and our general knowledge of dealing with the outdoor man. Our route was to be first to Kharga Village, thence along the Darb el Gubari to the Oasis of Dakhla and its various villages, then by means of the Darb el Sugag to the little visited Oasis of Farafra, and from thence to



Baharia; returning to the Nile Valley at or about Minia, approximately along the route followed by Capt. Lyons in 1894, on his return journey from the Baharia Oasis.

El Kharga, which is the principal town of the Kharga Oasis, is a rather uninteresting mud-built town, with a population of something over 4,000. There are two small mosques with mud minarets standing out from the general level of the other buildings. The houses are irregular and in general small, and the streets are extremely crooked, narrow, and for the most part covered over either by the upper stories of the houses, or by earth roofs, so as to resemble tortuous tunnels.

The sand has encroached somewhat upon the east side of the town, and most of the cultivated fields and palm groves lie to the west. A number of wells furnish the water necessary for cultivation and for the domestic needs of the villagers.

A short distance north of Kharga is situated the Temple of Hibis, which was built by the Persian kings some 400 or 500 years before the Christian era, and is still in a very fair state of preservation. Several other interesting archaeological remains are also to be found in the vicinity, most of which have frequently been described.

Our final watering, before entering upon the Darb El Gubari, was at Bir Mansura, which is a good well some four kilometers north of Kharga. The word Bir means a new well, or rather it is used to designate a well which has been sunk within the actual knowledge of the living generation. For ancient well the term used is Ain. Bir Mansura, therefore, signifies that the well of Mansura has been bored in modern times, and as a matter of fact it was still unfinished in 1898, when the Government Survey party was in the oasis.

Soon after our swing towards the West from Bir Mansura, a belt of soft sand was crossed, a few kilometers in width, and we then entered upon a long succession of open flats, with intervening stretches of low, broken hills and isolated buttes, which lasted until we were well within the confines of the Dakhla Oasis.

The long line of escarpment could sometimes be seen far to the north, and long clear vistas towards the south and southwest could also sometimes be obtained. The country was almost wholly devoid of life, either animal or vegetable, and in fact we traveled for a distance of nearly sixty kilometers without seeing a single plant of any description. The wind-eroded buttes and mounds, the sculptured surfaces of rock and soil, and the occasional sand dune or patch of wind-drifted sand, all bore testimony to the potency of the wind in forming the topography of this desolate land.



Upon the fourth day out from Bir Mansura, our route turned towards the north, and a small well, with two stunted acacia trees growing close beside it, was soon reached. Other evidences of human occupation followed, and we soon saw one of the groups of tombs belonging to the village of Tenida.

The zone of the dead is, in general, the first sign that one is approaching a village, and oftentimes the more pretentious tombs are built in commanding positions and can be seen for long distances. Graves are sometimes surrounded by low walls of sun-dried mud, which are ornamented by inserted fragments of stone and colored with whitewash or red ochre.

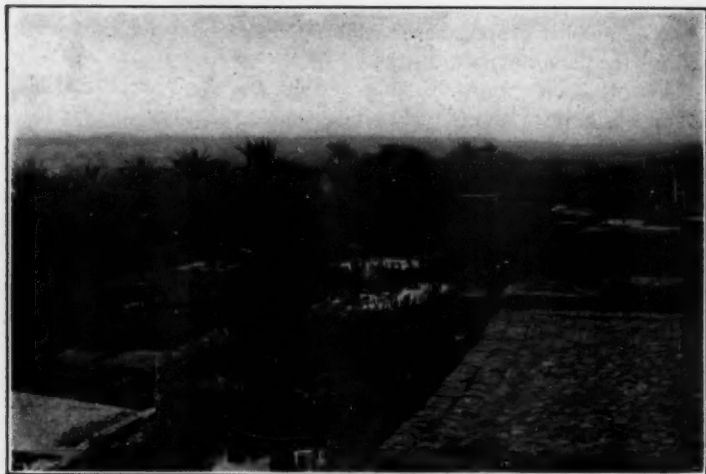


FIG. 6.—Rashida from a housetop.

The village of Tenida is situated, as are most of the other oasis villages, upon and surrounding a small hill. It is the most easterly of the Dakhla group of settlements, and has, no doubt, at all times been liable to raids from marauding parties of the desert nomads. It is surrounded by a wall, which is pierced by openings, fitted with large heavy gates. Hoskins, who visited the place in 1837, reports that it was at that time deserted, owing to its unprotected state, and distance from the other villages. There are two wells within the walls, and a number among the surrounding fields and groves, but the region as a whole does not look prosperous or fertile. We stayed for half a day at Tenida, watering and resting our camels and

attempting unsuccessfully to obtain eggs, poultry, or fresh meat for ourselves and our men.

Upon leaving Tenida, our next objective point was the town of Müt, which is the administrative headquarters of the Oasis of Dakhla. The distance from Tenida to Müt is about 38 kilometers, and the road connecting the two places passes the two small villages of Smint and Masara, with their small patches of cultivated land.

The town of Müt contains some 1,500 inhabitants and is built in the usual manner, upon a small rough hill. It is surrounded by a rather badly built mud wall, which we were told had been constructed by forced labor, under the direction of the Mudir, during the time of the Dervish raids. As a protective measure, however, it would not rank very high. There are two very good wells within the town, and at one of these a saquia is steadily at work raising water. This is rather an unusual feature in one of these desert villages, and indicates a larger amount of energy and enterprise than is common.

About 2 kilometers to the southwest of Müt are the large and most interesting ruins of what has once been a walled town. The place is evidently very ancient, and the unmistakable brick walls and foundations of the Roman architects come very far up in the series of remains which have gradually accumulated.

A large pit-like depression occupies the center area of the ruins, and a tunnel has been driven from this to the lower ground outside the walls. A stele which was brought from this ruin by Capt. Lyons recorded the very complete details of a long lawsuit over a water-right under one of the Egyptian dynasties, and a full examination and excavation of the place would no doubt reveal many interesting facts concerning the earlier occupancy of the oasis. The cultivated fields extend for only a few kilometers to the west of Müt, and then the sand begins. It looks very forbidding and impossible, and but little is known as to its distribution or extent. Several attempts have been made to penetrate this region, but with little success.

Capt. Lyons passed along the eastern edge of the dunes on his journey from Müt towards Selima in 1893-94, but this route gradually bears away from the sand, and so he was unable to observe its southerly extension. Mr. W. J. Harding King has recently traveled for a considerable distance towards the southwest, however, and reports the country in that direction as more easy of access than had been anticipated.\*

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\* *Geog. Jour.* Vol. 39, 1912, No. 2, pp. 133-137.

We stayed for nearly two days at Müt, and then began the long northward leg of our journey. Our first stop was at Rashida, and we found this to be by far the most attractive and prosperous-looking of all the villages we saw. It stands, as is common, upon a hill, and is surrounded by very fertile looking palm groves and walled gardens, in which oranges, lemons, bananas and other fruit abound. The village itself contains two small flour-mills, worked by oxen; a mosque,

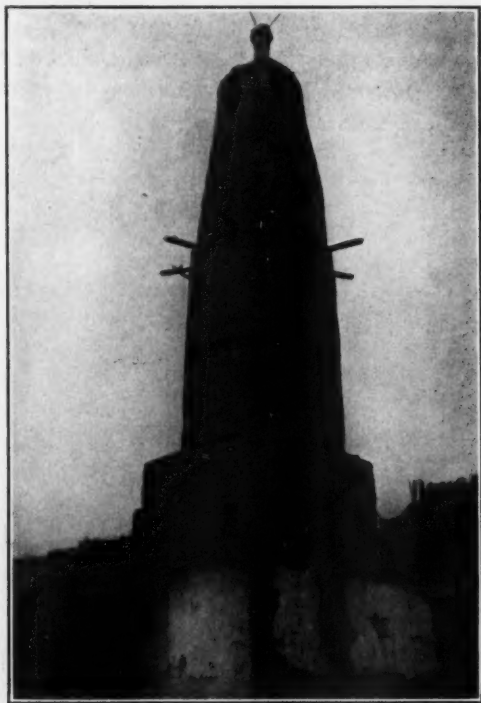


FIG. 7—Mosque minaret at Qasr Dakhli.

a school, and a number of neat-looking houses. We were taken to the flat roof of one of these houses by a head-man of the place and got a splendid bird's-eye view of the groves, wells and cultivated land.

The next village we passed was Budkulu, which seemed to be a perfect antithesis to Rashida, dirty, squalid and poverty stricken. A few hours more brought us to Qasr Dakhli, which is the largest and most interesting town in the Dakhla basin. It lies almost at the foot

of the northern rim, and is surrounded in the usual manner by a strong and formidable-looking wall, which is pierced by several gateways. The streets of the place are almost as dark and devious as are those of Kharga, and are skillfully protected in many places by heavy doors or gates, and commanded at other points by loopholes in the upper walls of the houses. A marauding enemy would have a particularly strenuous time of it in Qasr Dakhli if the fighting ability of the inhabitants is at all commensurate with their proficiency in military engineering. The town contains between 3,000 and 4,000 people, three good-sized mosques with prominent minarets, and two good wells. We were escorted about the place by some of the head men, and shown several of the leading local industries,—mat making, flour milling and shoe and pottery making. Of these several activities the pottery manufacture is the most important, a very good quality of clay being found in the vicinity. The potter's shed, in the establishment we inspected, contained six wheels, and the quality of the output was excellent. Several kilns were in use for the burning, and bundles of dried casuarina\* were used as fuel.

The Darb el Sugag, which we were to follow from Qasr Dakhli to Farafra, climbs the escarpment within a few miles, and the outlook as one approaches the foot of this formidable barrier with a train of heavily loaded camels, is not at all encouraging. The caravan route winds in among rough hills and terraces, and the height of the wall ahead seems steadily to increase. At last the way to the top becomes visible,—a long slope of wind-drifted sand which spreads down fan-wise from the mouth of a gorge far above. The camels are obliged to tack up this sand slope in long, sinuous curves, and many and weird are the words of encouragement or vituperation hurled at them by their puffing drivers.

At last, however, the top is gained, and a look back over the immense oasis almost repays one for the climb. The rim through which the way has just been won, stretches away in mysterious lines east and west, and the basin itself is only limited by the blue of the infinite toward the south. Here and there one can see the faint dabs of green-grey which mean palm groves, the grey-brown knobs which mean villages, the yellowish-brown patches of the cultivated lands, or the white speck of a tomb. But in the main the picture is just one of the desert itself, with its sands and sun-browned rocks; and one realizes how slight a mark man has yet been able to make upon this arid land in spite of his 4,000 years of effort. The escarpment is

\*So called from the modern Latin name of the casowary, its branches bearing a resemblance to the feathers of that bird.

about 300 meters in height, and having gained the top we found ourselves among the roughest description of kharafish surface, with intervening pockets and patches of loose sand.

To add to our discomfort the weather was becoming very bad, a cold wind from the N.N.W. was gradually increasing in force until it attained the velocity of a gale, and the drifting and almost blinding sand was cutting our faces even as we sat upon our camels. At last our guide gave it up and confessed himself beaten, and so we put down our camels in the most sheltered spot we could find amid the howling desolation, and made our camp. The succeeding night was the most unpleasant one we experienced while in the desert. The



FIG. 8—Camels drinking at Bir Dikker.

temperature became quite low before morning ( $21^{\circ}\text{F.}$ ), and the wind never ceased.

It was very bad and uncomfortable for the camel boys with their scanty clothing and covering. They lay huddled together in such shelter as they could find, under the lee of their camels, and followed the desert dweller's universal practice of wrapping the major part of their covering about their heads.

Soon after our start in the morning Abu Salem found what he had been looking for the evening before:—the entrance to one of the "sugags," or passages, between the sand hills, to which reference has been made above. Travel along these sugags is wonderfully easy.

The surface of the ground is soft and even, and the large padded feet of the camel give one the sensation of riding over firm, springy turf.

Occasional small patches of sand are met with, but the ground is for the most part clear.

Having once entered the sugags, we passed through them with only one intermission in crossing a sand field, until the south end of the Oasis of Farafra was reached, at Bir Dikker. We made the very interesting discovery of numerous fragments of ostrich egg-shell among the sand of the dunes. The ostrich can not have inhabited this region for a long time, but the egg-shell seems to be fairly common. Bir Dikker is a typical desert well, and when we arrived there it was carefully covered over with a flat stone and the joints round the edges were sealed with mud. A small basin close at hand, which has been scooped out in the sand and lined and puddled with mud, is used to water camels. A clump of stunted palms, together with the converging desert trails, serves to indicate the position of the well. The water is fair but not very plentiful.

The Oasis of Farafra, in which we had now arrived, is the least known of any of the Inner Oases. It has been visited by but few Europeans, and is markedly different from the other oases, in the character of its inhabitants. The town of Farafra is located, as usual, on a small hill, but its main feature is a large, fort-like community house which occupies the larger part of the place. The inhabitants are grave, dignified and courteous, but quite unapproachable, and very different in manner from the people of the other towns we visited. They belong chiefly to the strict Senussi sect of Mohammedans, and there is a Senussi monastery a little distance outside the village walls.

A site for our camp was allotted to us in an open sandy space between the village and its well, and most of the population came and squatted down in a respectful and attentive row to watch proceedings. Their curiosity once satisfied, however, they left us pretty well alone, and about all we saw of them afterwards was the dim and shadowy silhouette of the women, as they made their early morning trips across the sand to the well for the day's supply of water.

Our first call upon arriving at the village had, of course, been upon the local Omdeh and we were received in a low, dark chamber, around the walls of which were arranged a number of guns, ancient in pattern but evidently still in service. We sat upon the mats with several of the local sheikhs and were regaled with coffee and some wonderful dates, but although Abu Salem made gallant effort to keep up conversation with his only two English words, "Very good," and



repeated them with an affirmative, declamatory or interrogative inflexion, again and again, and we used our scant score of Arabic words in the same comprehensive fashion, the conversation soon languished and the interview terminated. We stayed at Farafra two days, but were never invited to inspect either town or gardens, and so saw rather less of this most interesting place than we could have wished.

The village watering-place is a large "ain," half a mile to the south. It is a pool or pond some 75 feet in diameter, and the bubbling up of gas from the well can be seen about in the center. The water is used in all the different ways which the needs of the inhabitants suggest—



FIG. 9.—Well boring at Farafra.

for drinking, stock watering, laundry purposes, bathing, soaking goat skins, and sky-larking of the children, and then the small residue is used for irrigation. Several of these operations are carried on in the pool itself, and so the general sanitary condition of the water may be imagined, but not described. A small clam-like bivalve lives in large numbers in the warmish water, and dies, or is thrown out upon the bank to add to the general odor. As this well was the only possible source of supply for our use between Farafra and Baharia, we dosed our water rather liberally with potassium permanganate.

The caravan road, after leaving Farafra village, crosses the floor of the basin for nearly forty kilometers, to a small well known as



Wadi Abu Hessn, where a small quantity of rather indifferent water may be obtained. The country about this well is very typical of the region—thousands of small wind-eroded chalk mounds, from the size of a barrel to that of a house, sometimes hemispherical, but frequently looking somewhat like an inverted bottle. Sir Archibald Edmonstone, writing in 1822, quotes Belzoni to the effect that hillocks of this type, which are very common near the Baharia Oasis, are doubtless the tombs of the army of Cambyses!; the tradition being that Cambyses, who was one of the Persian rulers of Egypt, in the XXVIIth dynasty, sent an army of 50,000 men to subdue the Oasis of Jupiter Ammon, and that they were lost in the desert and never heard of again.



FIG. 10—Olive-oil mill at Bawitte.

We entered the Oasis of Baharia at its extreme southwest angle, and had a splendid view of the basin from the edge of the rim. This rim is comparable in height and steepness with the one up which we climbed after leaving Dakhla, and its ascent must be nearly as difficult for camel trains traveling south. The floor of the oasis, as seen from above, looks nearly level and unobstructed for several miles, with small hills and ridges showing up further on. A few stunted trees or bushes can also be seen here and there. The first signs of human habitation which we saw in the basin were at Ain El Heuss,

which is a small, wall-protected settlement, with a few palms, and patches of cultivated ground around it.

There are some very striking examples hereabouts, of the subterranean aqueducts of the Romans. The outward and visible signs of one of these aqueducts will be a line of small irregularities upon the surface of the ground, some twenty or thirty yards apart. These are the traces of the manholes, or spoil-shafts, which the tunnel drivers sunk and utilized for sending up the debris from the headings.

Often the tunnels are now in disuse, and the manhole shafts full of drifted sand, but here and there a line of openings will be seen which have been kept clear of sand by the people of to-day, and upon looking down there one can see the tiny stream of water at the bottom, which the Roman engineers worked so hard to gain. Some of the tunnels are several kilometers in length and in some places the heading is at least 100 feet underground. Beadnell has given a graphic description in "An Egyptian Oasis" of an exploration of one of these remarkable aqueducts.\*

The chief settlements in the Baharia basin are the two dual towns of Qasr Baharia-Bawitte and Zubbo-Mandisha. These are all situated near the northern end of the depression, where the water is most abundant. Bawitte was our objective point and was reached the next day after passing El Heuss. We were first made aware of our nearness to the settlement by the sight of a party of grave-robbers at work and a closer acquaintanceship with local conditions revealed the fact that this was indeed one of the major local industries.

The towns of Bawitte-Qasr Dakhel are pretty well surrounded by vast burying-grounds and necropoli, in which the accumulated bones of the last 4,000 years have been laid away, and the gentle Baharian digs open and pilfers these graves of such poor little trinkets of personal adornment as he can find, throwing out odd fragments of humanity with the greatest carelessness. So much so, that the refuse heaps around the doors of many of the village houses, and over which the village children play, are full of such bones and morsels of human clay. The profession seems to be an open one—quite free and untrammelled by any regulations, local or otherwise—but Bawitte would be much more attractive if they would at least clear up the bones.

The conditions of water supply are entirely different here from those in the other oases we visited, inasmuch as the larger part comes

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\* *An Egyptian Oasis*, H. J. Llewellyn Beadnell, London, 1909, page 179, *et seq.*

from natural springs and outlets and flows in part through natural water courses after reaching the surface. A zone of water bearing strata crops out upon each side of the twin towns—north and south—and the palm groves along the northern side are both good and abundant.

Bawitte supports an intermittent sort of outdoor bazaar, in a large open space near the mosque. Our needs were confined to sheep, turkeys, bread and fruit, all of which we obtained of excellent quality.

The drifting sand is encroaching very seriously upon some of the palm groves to the north and northwest of Qasr Baharia, and



FIG. 11—Walled gardens at Bawitte, showing human bones from rifled graves.  
Photo by D. T. MacDougal.

also bids fair to choke some of the wells in this locality, but on the whole the district is fairly free from sand, and in spite of the general untidiness and air of desolation due to the operations of the grave-robbers in so many directions, it looks prosperous and fertile. We were shown through some very well cultivated gardens, and also inspected some establishments for expressing and preparing olive-oil, manufacturing camel-saddles, and making mats. There are numerous early Egyptian and Roman remains hereabouts, in addition to the extensive regions of tombs, and it appears probable that to the Romans at least it was a very important place.

Upon our departure from our camp near Bawitte, we passed near to the villages of Zubbo and Mandisha, but did not visit them. Our last halt in the basin was at the little spring of Ain Gelid, which lies near to the foot of the wall at the N. E. end of the basin.

Several of the caravan routes between Baharia and various terminal points in the Nile Valley leave the basin near this point, and Ain Gelid is the usual last watering-place touched at before crossing the desert by these various roads. The ascent of the rim is in this case comparatively easy, being up a long, loamy slope. Once on top, however, the usual kharafish is encountered for several miles, but the surface soon improves again and is fairly good until the remarkable

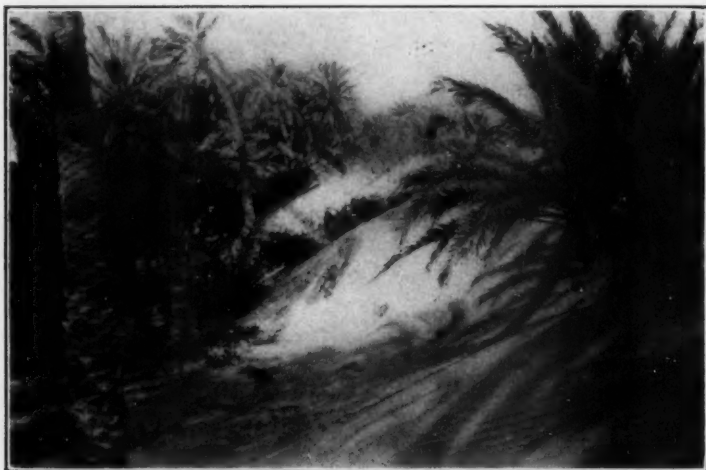


FIG. 32.—Sand encroachment at Qasr Baharia.

line of sand hills known as the Abu Moharik is approached. A stretch of kharafish is crossed near to the western edge of the sand, which is chiseled out of a particularly hard limestone. The upstanding edges and points upon the surface are very acute, and the driving sand has polished it all, until it looks and glistens in the sunshine like a surface of rough ice.

The Abu Moharik hills are one of the most noteworthy of the Libyan sand ribbons as far as is yet known. They have never yet been traced over the desert from end to end, but different explorers and observers have crossed them at various points, and so their main features are known. The belt is reported as starting somewhere

near the tiny Oasis of Moghara, in Lat.  $30^{\circ}12' N.$ , Long.  $29^{\circ}0' E.$ , and persisting in a practically unbroken line down to the extreme southern end of the Kharga Oasis in Lat.  $24^{\circ}$  or thereabouts. Its further possible extension towards the south is as yet unknown, but the distance between the two above mentioned points is approximately 700 kilometers. This was in reality the same line of sand we crossed soon after leaving Kharga. The average width of this sand belt is probably not over 5 kilometers.

The crossing of Abu Moharik was the only serious obstacle we encountered on our journey between Baharia and the Nile, most of the surface beyond it being of the "serir" type—deadly monotonous,



FIG. 13—Dividing line between the desert and fertile ground; Nile valley, west of Minia.

but easy and pleasant to travel over. The only incident worthy of note which we encountered by the way was a glimpse at the operation of salt mining, as carried on by a party of Nile Valley men. The salt seems to occur in the form of large irregular masses of crystals, distributed unevenly throughout the ground. These masses they search for and dig out when found. An area of some thousands of acres has been exploited in this manner, and somewhat resembles a prairie-dog town.

The spirits of our camel boys had been steadily rising, as the Nile Valley, and the end of the journey, were approached, and singing, horse-play, and skylarking were very much in order. At last, from the shoulder of a small hill we saw it—the narrow grey-green line in

the far distance, which represented the entire width, although but a small portion of the length, of the wealth of Egypt. It does not look very imposing as viewed from the hinterland of the desert, and the line of division, when one reaches it, between desert and vegetation, is as clear-cut as though made with a knife. We realized more keenly than before how formidable the desert must have seemed to the first men who essayed to cut loose from the fields and flesh-pots of Egypt, to cross it and discover its secrets.

Our "land-fall" was made near the village of Samalut and we then had to turn up the valley some twenty-five kilometers, to reach the town of Minia, which was to be the end of our camel journey. Our last camp was made just outside the wall of some nameless little Nile village, dirty, unsanitary and uninviting, and disturbed by the barking of seemingly countless thousands of dogs.

There are few roads worthy of the name among the fields of the valley. Land is too valuable to be used for such a purpose as road building. Communication is therefore perforce restricted to the tops of the dikes and canal banks, and the desert-bred camel sees many strange and fearsome sights upon either hand to upset his nerves and temper, as he walks upon the tops of these ridges.

Our animals, however, were encouraged, guided and exhorted along until at last Minia was reached and the journey ended. We had spent twenty-four days in the desert between Khargah and Minia, and had covered a distance of something more than 800 kilometers. We had fortunately experienced no serious mishap, and but slight discomfort, and our relations with our canal men (and camels) had been of the best.

It had interested us to note the points of difference between this new type of desert man and the Southwestern Indian, with whom we were familiar. The Bedouin, as we observed him, has a distinctly larger angle of possible directional error than has the Indian, or, in other words, his sense of direction is not so keen. He may vary, in either estimation or actual travel, some 5 to 10 degrees upon either side of a true course. His method of steering seems to be largely observational. He goes simply from one known point to another and of course, is also able to steer to some extent by the stars.

We found that he quickly learned and understood the kind of ground map which one so often uses in geographical conferences with Indians. He would, however, let pass without correction intentional errors in orientation or direction of given points, in a way few Indians would have done. We acquired much useful local topographical information, nevertheless, in this way.



Concerning the general results of our journey and observations, from a scientific point of view, it is as yet a little early to speak, but we at least obtained some extremely valuable comparisons between the Libyan desert and other arid regions with which we are familiar, as well as a most interesting insight into some of the conditions which are peculiar to this region alone.

## STUDIES ON CLIMATE AND CROPS

### 4. CORN CROPS IN THE UNITED STATES

BY

HENRYK ARCTOWSKI

The following figures, expressing in bushels the corn crop for the year 1906,\* show plainly how much more important the culture of maize is in the United States than in any other country:

United States.....	2,927,416,000
Europe.....	609,614,000
South America.....	198,988,000
Africa.....	37,889,000
Australia.....	8,608,000

It is difficult to realize the quantity of grain 2,927,416,000 bushels represents.

C. P. Hartley writes† that: "If the corn crop of the United States for 1906 had been placed in wagons, fifty bushels per load, and allowing twenty feet of space for each wagon and team, the train of corn would have reached nine times around the world at the equator."

A verification of this statement, prompted by curiosity, gave me 8.8 times around the equator.

Another quotation and we will have an idea of the commercial value of the maize crop harvested in the United States. The Hon. James Wilson, Secretary of Agriculture, in his report for 1909 says:

"The most striking fact in the world's agriculture is the value of the corn crop of 1909 in this country. It is about \$1,720,000,000. It nearly equals the value of the clothing and personal adornment of 76,000,000 people, according to the census of 1910. The gold and silver coin and bullion of the United States are not of greater value. This corn came up from the soil and out from the air in 120 days—\$14,000,000 a day for one crop, nearly enough for two Dreadnoughts daily, for peace or war."<sup>‡</sup>

The following diagram (Fig. 1) shows the average yield of corn per acre for the years 1891 to 1909. We see that in 1901 there

\* Yearbook of the Department of Agriculture for 1908, p. 507. Washington, 1909.

† Cyclopaedia of American Agriculture, Edited by L. H. Bailey. v. 2, p. 403. New York, 1907.

‡ Annual Report of the Dept. of Agric. for the year ended June 30, 1909. p. 10. Washington, 1910.



were only 16.7 bushels per acre harvested, while in 1906 there were 30.3. To make it plainer, I transcribe the figures of corn production for these years. They are: 1906, 2,927,416,091; 1901, 1,522,519,891. The difference, 1,404,896,200, nearly equals the entire crop of 1901. This difference gives a good idea of the range of variations occurring.

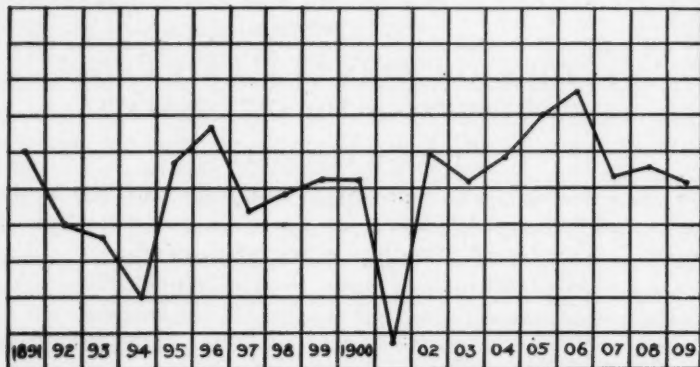


FIG. 1.

It is in the "corn belt" comprising the States of Iowa, Ohio, Indiana, Illinois and portions of Missouri, Kansas and Nebraska that the cultivation of maize is concentrated. Texas and Oklahoma, however, produce also great quantities of corn. In 1908 the corn acreage was as follows:

Illinois, 9,450,000; Iowa, 9,068,000; Texas, 7,854,000; Missouri, 7,542,000; Nebraska, 7,621,000; Kansas, 7,100,000.

More than a million acres were also given to maize culture in each of the following states: Pennsylvania; Virginia, North and South Carolina, Georgia, Ohio, Indiana, Michigan, Wisconsin, Minnesota, South Dakota, Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Oklahoma and Arkansas.\*

One of the maps of the Census Atlas gives the distribution of corn production for 1900.† Notwithstanding the fact that this map expresses the distribution of the amounts of crop for one particular year,—and may therefore differ materially from one which could be drawn by using averages of a certain number of years,—it is still very interesting to compare it with the rainfall map.‡

This comparison suggests a search for the connections which may

\* Agricultural Statistics, 1908. *Yearbook of Agric.* 1908, p. 509.

† Statistical Atlas of the United States 1900. Plate No. 154.

‡ U. S. Geol. Surv. Water Supply Paper 234. 1909.

exist between the corn crops and the variations of rainfall. Moreover, in a paper published in 1903, J. W. Smith\* has shown that the corn crops depend very greatly on the rainfall of the months of June and July. The production of corn in the United States depends, therefore, entirely on the variations of rainfall in the "corn belt," or the central portion of North America.

In this paper I shall study geographically the corn crop statistics for the years 1891 to 1909. The figures in Tables 1 and 2, which follow have been calculated from the data given in a paper of Charles C. Clark† and the Yearbooks of the Department of Agriculture.

TABLE I. 1891-1900.

	MEAN	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900
	Bush. p. acre:										
Maine.....	37.1	+0.4	-1.6	-6.8	+2.8	+4.0	-0.1	-0.1	+2.0	-1.1	-1.1
New Hampshire.....	37.3	-1.5	+0.5	-5.6	-3.0	+2.9	+4.7	-3.3	+3.7	+1.7	-0.3
Vermont.....	38.0	-1.7	-0.9	-6.5	+1.9	+6.7	+1.1	-3.9	+4.1	-2.0	+1.1
Massachusetts.....	38.0	+1.5	+0.7	-4.5	-3.5	+5.0	+5.0	-5.5	+2.0	-2.0	0.
Rhode Island.....	37.7	+2.8	+1.7	-7.3	-0.3	-0.8	+2.3	-0.7	+3.3	-0.7	+0.3
Connecticut.....	35.1	+0.9	-0.6	-6.9	-4.1	+2.8	+2.9	-3.6	+1.9	+3.9	+2.0
New York.....	31.0	-0.1	+1.1	-2.4	-3.7	+3.7	+2.1	-0.9	+1.1	-0.9	+0.1
New Jersey.....	33.1	+1.1	-1.5	-7.2	0.	-0.1	-0.1	-1.6	+3.9	+5.9	-7.4
Pennsylvania.....	34.4	+0.9	-1.9	-7.9	-0.4	+1.1	+7.6	+3.6	+4.0	-0.4	-0.1
Delaware.....	23.0	-1.0	-4.1	+1.6	-1.0	-2.0	-1.0	+6.0	+3.0	-1.0	+1.0
Maryland.....	27.4	-1.0	-6.8	-3.2	-4.5	-0.6	+4.6	+5.6	+3.6	+4.6	-1.4
Virginia.....	18.0	+0.8	-3.6	0.	+0.8	-0.3	+2.6	-0.9	+3.1	+1.1	-2.9
West Virginia.....	25.1	+2.2	-2.6	-3.4	-6.6	-0.9	+4.9	-0.6	+3.9	+0.9	+1.0
North Carolina.....	13.8	+1.3	-2.6	-0.5	+0.6	+1.7	-0.8	+0.3	+1.3	+0.3	-0.8
South Carolina.....	9.8	+2.0	+0.9	-1.9	+1.6	+1.5	-0.6	-0.6	+0.4	-0.6	-2.6
Georgia.....	11.0	+1.2	+0.2	+0.1	+0.7	+2.0	0.	0.	-2.0	-1.0	-1.0
Florida.....	9.6	+1.4	-0.6	+0.1	+0.5	+1.6	+0.4	-1.6	-0.6	+0.4	-1.6
Ohio.....	32.7	-0.7	-3.3	-8.9	-6.4	-0.1	+8.3	-0.2	+4.3	+3.3	+4.3
Indiana.....	32.6	+0.7	-3.3	-7.9	-3.7	+0.2	+2.4	-2.6	+3.4	+5.4	+5.4
Illinois.....	32.8	+0.7	-6.6	-7.1	-4.0	+4.6	+7.7	-0.3	-2.8	+3.2	+4.2
Michigan.....	30.0	-0.5	-5.0	-6.3	-6.8	+3.8	+8.0	+1.5	+4.0	-5.0	+6.0
Wisconsin.....	31.6	-4.9	-4.3	-1.8	-10.9	+0.2	+5.4	+1.4	+3.4	+3.4	+8.4
Minnesota.....	28.6	-2.1	-1.6	-0.3	-10.2	+2.6	+1.9	-2.6	+3.4	+4.4	+4.4
Iowa.....	32.1	+4.6	-3.8	+1.8	-17.1	+3.0	+6.9	+3.1	+2.9	-1.1	+5.9
Missouri.....	27.6	+2.3	+0.1	+0.3	-5.6	+8.4	-0.6	-1.6	-1.6	-1.6	+0.4
North Dakota.....	21.0	-3.0	+0.4	-0.3	-1.8	+0.3	+14.0	-4.0	-2.0	+2.0	-5.0
South Dakota.....	21.5	+1.0	+0.8	+2.2	-17.3	-10.4	+4.5	+9.5	+6.5	+4.5	+5.5
Nebraska.....	25.3	+9.9	+2.9	-0.1	-19.3	-9.2	+12.3	+4.7	-4.3	+2.7	+0.7
Kansas.....	21.6	+5.1	+2.9	-0.3	-10.4	+2.7	+6.4	-3.6	-5.6	+5.4	-2.6
Kentucky.....	26.0	+4.0	-2.7	-2.5	-3.0	+5.2	+2.0	-3.0	+2.0	-4.0	0.
Tennessee.....	22.1	+0.6	-1.8	-0.8	-0.2	+2.9	+0.9	-1.1	-2.9	-2.1	-2.1
Alabama.....	12.8	-0.1	-0.6	-1.3	+0.9	+3.1	-0.3	-0.8	+2.2	-0.8	-1.8
Mississippi.....	14.8	+0.4	-1.1	-1.7	+2.4	+1.0	-1.3	-0.3	+2.2	+1.2	+3.8
Louisiana.....	16.4	+0.9	-1.6	-2.2	-0.2	+1.7	-3.4	+0.6	+1.6	+1.6	+0.6
Texas.....	10.3	+0.2	+2.1	-1.7	-0.3	+7.1	-9.8	-0.8	+5.7	-1.3	-1.3
Arkansas.....	18.4	+2.8	-0.9	-2.2	+0.8	+3.1	-4.4	-2.4	+1.2	+1.6	+0.6
Montana.....	(23.8)	.....	-4.4	+3.7	+8.9	+1.2	+2.2	-5.8	+2.2	-0.8	-8.8
Wyoming.....	(22.6)	.....	-4.1	-4.1	+7.4	+4.9	+2.4	-10.6	-6.6	-0.6	+11.4
Colorado.....	19.0	+2.5	+3.3	-2.5	+0.7	+1.7	-3.0	0.	-1.0	-2.0	0.
New Mexico.....	21.6	-3.3	-1.6	-3.7	-2.5	+5.6	-5.6	+5.4	-0.6	-1.6	+0.4
Utah.....	21.1	-2.1	-3.0	+4.3	-0.8	+3.9	+0.9	-0.1	-1.1	-1.1	-1.1
Washington.....	(18.2)	.....	-0.2	+3.1	+2.6	-1.1	-4.2	-2.8	-6.2	+4.2	+2.8
Oregon.....	24.1	+2.9	-2.6	+0.6	+1.3	+2.3	-2.1	+0.9	-0.1	-2.1	-1.1
California.....	30.2	+4.3	+0.1	+6.9	-10.9	+4.3	+6.8	+1.3	-4.2	-3.2	-5.2

\* Relation of precipitation to yield of corn. *Yearbook U. S. Dept. of Agric., 1903.*

† Corn crops of the United States, 1866-1906. *Bur. of Stat.—Bull. 56. 1907.*

TABLE II. 1900-1909.

	MEAN	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Bush. p. acre:											
Maine.....	35.4	+0.6	+4.0	-13.7	-5.2	+4.3	-1.1	+1.6	+1.6	+5.1	+2.6
New Hampshire.....	33.2	+3.9	+5.4	-9.8	-12.1	-5.8	+3.9	+4.4	+1.9	+5.9	+2.0
Vermont.....	34.5	+5.5	+5.5	-12.7	-11.1	+1.4	+0.2	+1.0	+1.5	+5.8	+2.5
Massachusetts.....	36.1	+1.9	+4.4	-4.8	-12.1	-0.1	+1.4	+3.6	-0.1	+4.3	+1.9
Rhode Island.....	32.9	-0.9	-0.8	-4.5	-2.8	+1.2	-0.4	+0.2	-1.7	+9.9	+0.3
Connecticut.....	36.8	+1.2	+2.2	-5.3	-14.4	+2.1	+5.9	+3.2	-3.8	+4.5	+4.2
New York.....	31.0	+1.0	+2.0	-6.0	-6.0	-3.7	+0.5	+3.9	-4.0	+7.8	+5.0
New Jersey.....	34.1	-1.1	+2.8	+0.4	-10.1	+3.9	+1.7	+2.2	-2.6	+3.9	-1.4
Pennsylvania.....	34.4	-9.4	+0.6	+1.7	-3.2	-0.4	+4.5	+5.8	-1.9	+5.1	-2.4
Delaware.....	29.1	-5.1	+0.9	-1.1	-1.6	+1.3	+1.3	+0.9	-1.6	-2.9	-1.9
Maryland.....	32.9	-6.9	+1.3	-0.5	-4.2	+0.5	+4.0	+2.1	+1.3	+3.7	-1.5
Virginia.....	22.7	-6.7	-0.5	-0.7	+0.1	+0.6	+0.7	+1.6	+2.3	+3.3	+0.5
West Virginia.....	27.5	-0.5	-4.5	-1.0	-4.0	-2.2	+2.3	+2.8	+0.5	+3.7	+3.9
North Carolina.....	14.8	-2.8	-2.8	-0.9	-0.1	+0.4	-0.9	+0.5	+1.7	+3.2	+2.0
South Carolina.....	11.6	-4.6	-4.7	-1.2	-1.3	+0.8	-0.7	+0.6	+3.5	+2.5	+5.1
Georgia.....	11.5	-1.5	-1.5	-2.5	+0.2	+0.4	-0.5	+0.5	+1.5	+1.0	+2.4
Florida.....	10.2	-2.2	-1.2	-1.6	-0.3	-0.5	-0.1	+0.8	+1.1	+0.3	+2.4
Ohio.....	35.6	+1.4	-9.5	+2.4	-6.0	-3.1	+2.2	+7.0	-1.0	+2.9	+3.9
Indiana.....	34.7	+3.3	-14.9	+3.2	-1.5	-3.2	+6.0	+4.0	+1.3	-4.4	+5.3
Illinois.....	34.5	+2.5	-13.1	+4.2	-2.3	+2.0	+5.3	+1.6	+1.5	-2.9	+1.4
Michigan.....	32.7	+3.3	+1.8	-6.3	+0.8	-4.1	+1.3	+4.3	-2.6	+0.9	+2.7
Wisconsin.....	33.2	+6.8	-5.8	-5.0	-3.9	-3.5	+4.4	+8.0	-1.2	+0.5	-0.2
Minnesota.....	29.4	+3.6	-3.1	-6.6	-1.1	-2.5	+3.1	+4.2	-2.4	-0.4	+5.4
Iowa.....	32.3	+5.7	-7.3	-0.3	-4.3	+0.3	+2.5	+7.2	-2.8	-0.6	+0.8
Missouri.....	28.6	-0.6	-18.5	+10.4	+3.8	-2.4	+5.2	+3.7	+2.4	-1.6	-2.2
North Dakota.....	33.4	-7.4	-0.8	-4.0	+1.6	-2.2	+4.1	+4.4	-3.4	-0.4	+7.6
South Dakota.....	27.4	-0.4	-6.4	-8.5	-0.2	+0.7	+4.4	+6.1	-1.9	+2.3	+4.3
Nebraska.....	27.4	-1.4	-13.3	+4.9	-1.4	+5.4	+5.4	+6.7	-3.4	-0.4	-2.6
Kansas.....	22.4	-3.4	-14.6	+7.5	+3.2	-1.5	+5.3	+6.5	-0.3	-0.4	-2.5
Kentucky.....	26.7	-0.7	-11.1	+0.3	-0.1	+0.2	0.	+6.3	+1.5	-1.5	+2.3
Tennessee.....	23.0	-3.0	-8.8	-1.1	+0.5	+2.0	+1.6	+5.1	+3.0	+1.8	-1.0
Alabama.....	13.5	-2.5	-0.6	-3.1	+1.3	+1.5	+1.3	+2.5	+2.0	+1.2	0.
Mississippi.....	15.2	-4.2	-4.3	-3.7	+3.2	+3.9	-0.9	+3.3	+1.8	+2.1	-0.7
Louisiana.....	17.5	-0.5	-3.8	-5.0	-3.1	-2.4	-3.8	-0.3	0.	+2.3	+5.5
Texas.....	19.0	-1.0	-7.4	-10.9	+5.2	+3.6	+2.3	+3.5	+2.0	+6.7	+4.0
Oklahoma.....	24.2	+1.8	-14.7	+1.2	+1.3	+6.0	+0.2	+0.1	-0.2	+0.6	-7.2
Arkansas.....	18.7	+0.3	-10.6	+2.6	+2.2	+2.9	-1.4	+4.9	-1.5	+1.5	-0.7
Montana.....	23.2	-8.2	+1.8	-1.2	+0.9	-1.0	-3.8	+0.2	-0.7	+0.2	+11.8
Wyoming.....	28.0	+6.0	+11.5	-8.2	-8.6	+4.5	-1.1	-1.0	-3.0	0.	0.
Colorado.....	21.2	-2.2	-4.1	-4.7	-1.4	-0.7	+2.6	+6.7	+2.3	-1.0	+3.0
New Mexico.....	26.4	-4.4	+5.2	-4.4	-2.4	-3.7	-1.1	+3.0	+2.6	+0.6	+4.9
Arizona.....	26.5	-5.5	-8.5	-6.3	-4.1	-2.7	+0.5	+3.0	+11.0	+6.7	+5.6
Utah.....	26.9	-6.9	-7.5	-6.8	-5.5	+6.3	+9.3	+5.1	-1.4	+2.5	+4.5
Idaho.....	29.5	+8.5	-6.5	-4.8	+5.0	-0.2	-2.3	-1.2	+0.5	-0.5	+1.1
Washington.....	23.8	-3.8	-6.3	-0.8	-0.7	+0.9	+0.4	+1.4	+3.2	+1.7	+4.0
Oregon.....	25.8	-2.8	-5.0	-2.4	0.	+3.0	-2.8	+1.8	+1.7	+2.0	+4.9
California.....	31.3	-6.3	-0.3	-0.8	-0.6	-2.7	+0.7	+3.6	+2.7	+0.7	+3.5

The first table gives for each State, in bushels per acre, the average of the years 1891 to 1900 and the annual departures. The positive figures express bushels per acre above the average and the negative figures those below. The second table gives the departures for 1900 to 1909 from the means of these ten years. In this way the year 1900 is repeated in both tables, and, therefore, comparing the corresponding departures, we have a criterion of the relative value of the figures employed to draw the maps.

One sees directly that in the majority of cases the departures (for 1900) are less positive or more negative in the second table than in the first. This is due to the fact that on the average the harvests

were better during the years 1900 to 1909 than they were from 1891 to 1900, a fact due, in all likelihood, to the progress of agriculture and irrigation.

I shall now take up the examination of the maps, which have been drawn in exactly the same manner as those of the wheat crops published previously.\*

First, I shall take into consideration the decade 1891 to 1900, for which I reproduce the maps of 1894, 1896, 1898 and 1900.

These maps show that precisely in the same way as for the maps of temperature departures,† atmospheric pressure departures‡ and wheat crops, the areas of deficit and surplus are very extensive, but always less extensive than the entire area of the United States. One of the States, particularly favored, forms a positive center, around which less positive figures are grouped. In other places, or for another year, we observe one or more negative centers and again all around a decrease in negativity.

A striking fact is the lack of symmetry of the center of greatest departure for the positive as well as the negative areas. The map of the year 1898 furnishes an excellent example, the departure  $+6.5$  of South Dakota contrasting with the figure  $-6.6$  of Wyoming. In this as in other cases,—just as for the maps of wheat crops, temperature or atmospheric pressure departures,—the disposition of the positive and negative areas gives to the maps the appearance of representing the effect of a dynamical phenomenon proceeding by waves. This is clearly shown by the tendency of the areas, surrounded by equi-departure curves, to assume elongated forms.

Sometimes two or more distinct centers are connected, forming a wave, and, in other cases, such waves following different directions intersect each other. Peculiarities of one map may be found again on the map of the following year, but altered and displaced. It is, therefore, most probable that the variations of harvests depend on dynamical phenomena proceeding by waves. But if these statements lead to the conclusion that the climatic changes which affect the crops are dynamical, we must also admit that the phenomenon is too complicated to attempt its study by a simple comparison of maps drawn from annual means.

The comparison of the above maps with those giving the distribution of the surplus and deficit of wheat crops, for the same years, proves that the climatic changes, peculiar to these years, reacted very

\* *Bull. Amer. Geogr. Soc.*, vol. 42, p. 481.

† Arctowski: *L'enchaînement des variations climatiques*. Bruxelles, 1909.

‡ Arctowski: Variations in the distributions of atmospheric pressure in North America. *Bull. Am. Geogr. Soc.*, vol. 42, p. 270.

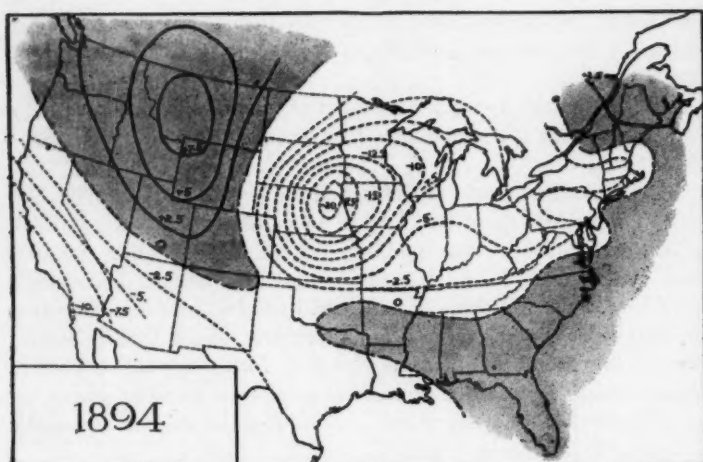


FIG. 2.

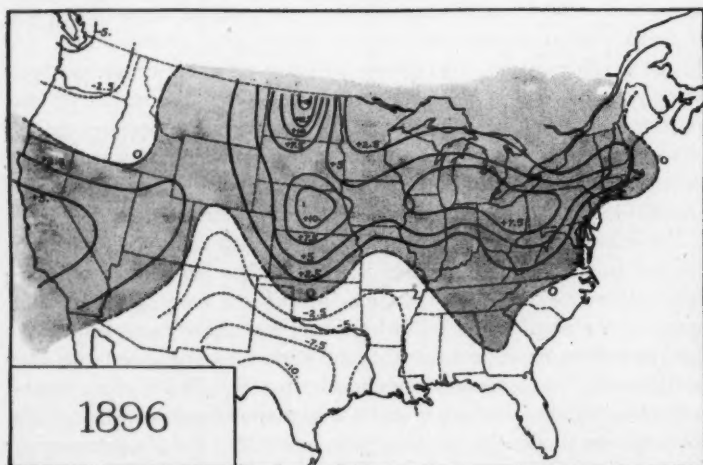


FIG. 3.

differently on corn and wheat.\* The same may be said about the maps of temperature and atmospheric pressure departures, a com-

\* Concerning the crops of maize, cotton and wheat, I transcribe the following statement from a paper of A. Platt Andrews: "Among these three crops may occur every conceivable combination of success and failure. The crops of the Southern States may be abundant when those of the Middle West are poor . . . You may find a small wheat crop, as in 1885 or in 1896, combined in each case with record breaking corn crop or vice versa. . . ." *Quart. Journ. of Economics*, 1906, p. 333.

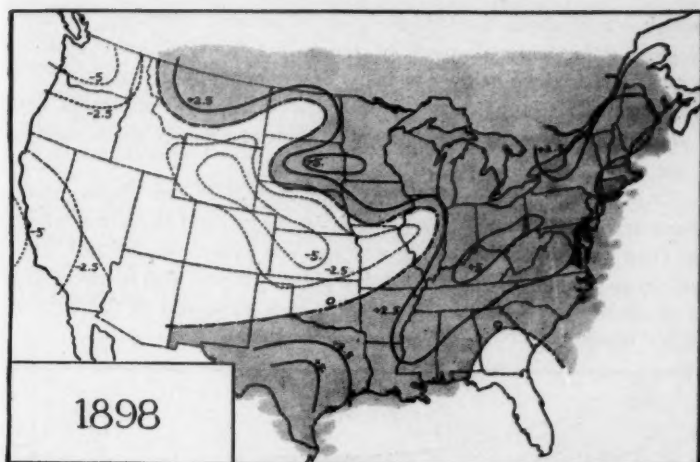


FIG. 4.

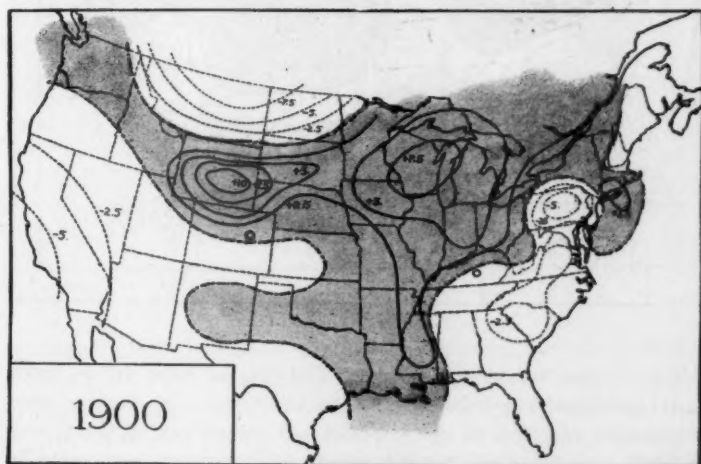


FIG. 5.

parison of which with the preceding maps shows that the apparent correlations are only suggestive,—but just enough so to warrant a deeper investigation by new researches.

It is the dynamical problem of the propagation of climatical variations which ought to be solved. As a starting point to this re-



search,—a research for which I am at present gathering meteorological data, from all parts of the world, for the years 1900 to 1909,—I reproduce below the maps of the corn crop departures for these years. It is the cause of the particularities of these maps that I should like to understand. I will therefore describe them such as I see them.

To simplify the description I shall hereafter call those years, characterized by positive departures, *fat years*, and those for which the corn crops were below the average *lean years*. I also call "*fat*" and "*lean*" the positive and negative areas. It will also be necessary to speak of the center of a fat or of a lean wave and of the axis of such a wave.

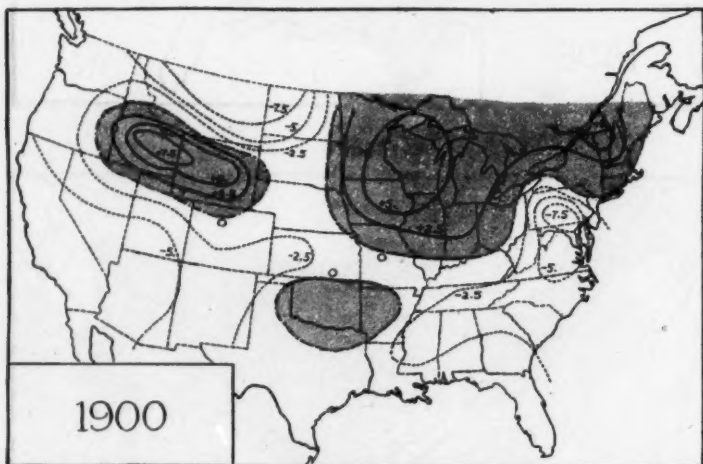


FIG. 6.

Let us now examine the maps. The map of 1900 differs from that reproduced above because of the increase in the average outputs shown in almost all of the States. A comparison of the means of tables 1 and 2 shows this increase to be particularly noticeable in the States of Delaware, Maryland, South Dakota, Wyoming, New Mexico, Utah and Washington, while it is only in the New England States and Texas that the averages of 1900 to 1909 are less than those for the years 1891 to 1900.

The distribution of the equi-departure curves, however, is obviously the same, which proves that we can draw conclusions from the appearance of the maps, that we can take into consideration even the



details they present. Now, if we compare the map of 1901 with that of the preceding year we can explain it as follows: The lean extending over the Atlantic States, in the form of a wave, and whose center, with a value of  $-9.4$ , was in Pennsylvania, moved westward, developed itself considerably and became much more pronounced, the central value being  $-18.5$ .

It is truly astonishing to see how the geographical distribution of the figures agrees with the conception of a center of crop deficit. From the figure  $-18.5$  observed in Missouri we note the figures  $-7.3$ ,  $-3.1$  toward the north,  $-14.9$ ,  $-9.5$ ,  $+0.6$ ,  $+2.0$ ,  $+5.5$  toward the North-East. In a southeastern direction we have  $-8.8$ ,

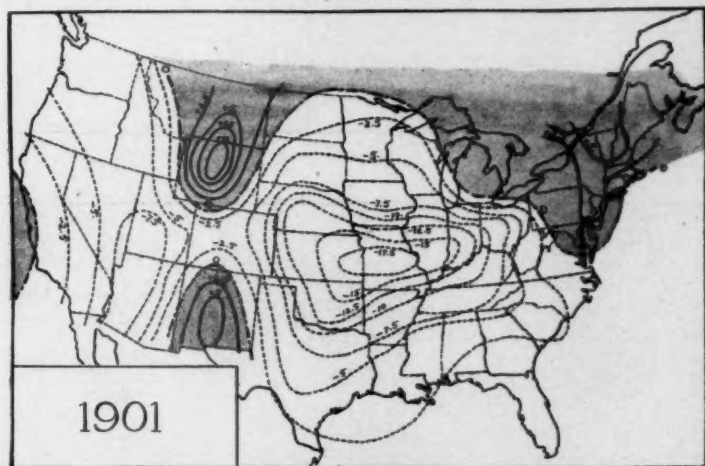


FIG. 7.

$-4.7$ , South:  $-10.6$ ,  $-3.8$ , and also toward the South-West, the West and the North-West of Missouri the figures are so distributed that the equi-departure-curves, far from being hypothetical, express just as plainly the resultant of a series of variable phenomena as isobars or isotherms of a meteorological map may do. And, as in the case of meteorological maps, the displacement of a center brings about the displacement of other centers, just as if they were driven ahead or carried along, we see here that the fats have been pushed away by the broadening out of the lean areas, from Wisconsin into Wyoming and from Oklahoma into New Mexico.

The positive wave of 1900, together with the negative saddle be-

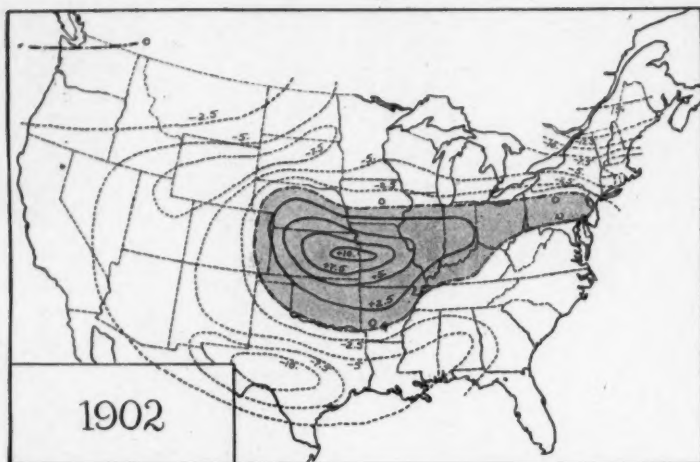


FIG. 8.

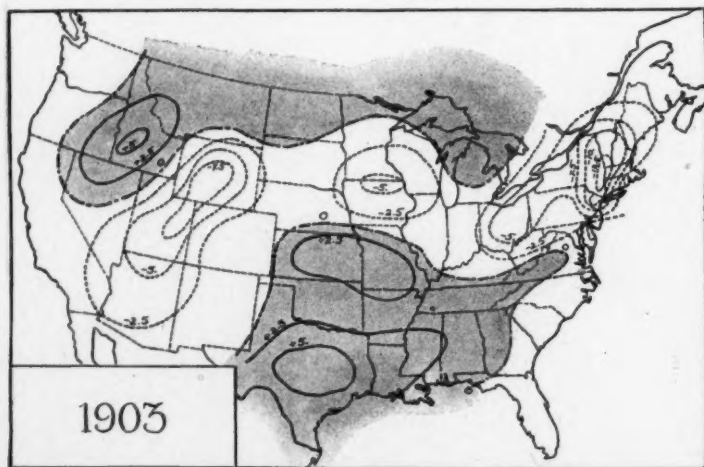


FIG. 9.

tween the two centers, has remained and the whole simply moved toward the West.

The values in the North-East, however, remained positive. In 1902, this fact seems to have been driven, in its turn, by a lean coming from the North whose departure  $-13.7$ , observed in Maine, is suffi-

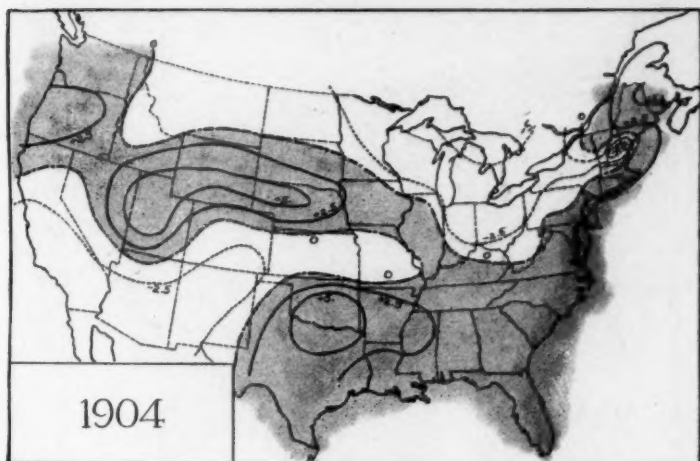


FIG. 10.

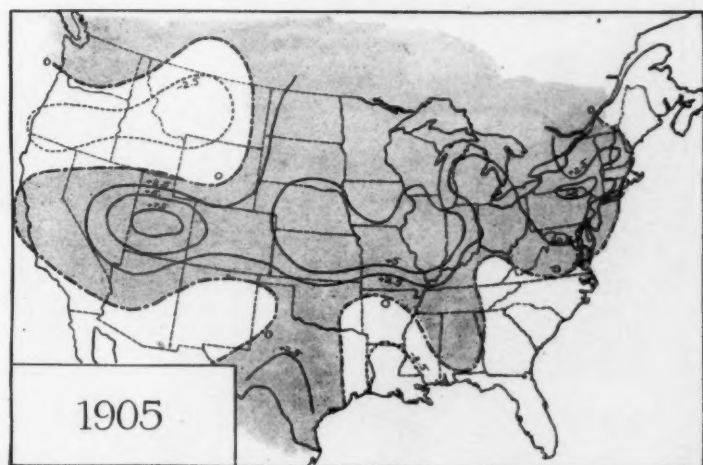


FIG. 11.

ciently characteristic. The fat has a peculiar oblong shape and its center has taken the place of the lean center of the preceding year. Moreover, the lean of 1901, pushed toward the West by this invading fat, took the shape of a horse shoe with two negative centers, one North and the other South of the fat. In 1903 it is a displace-



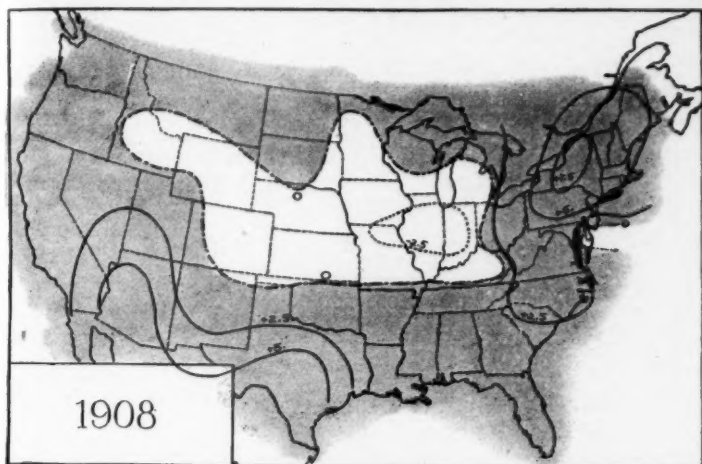


FIG. 14.

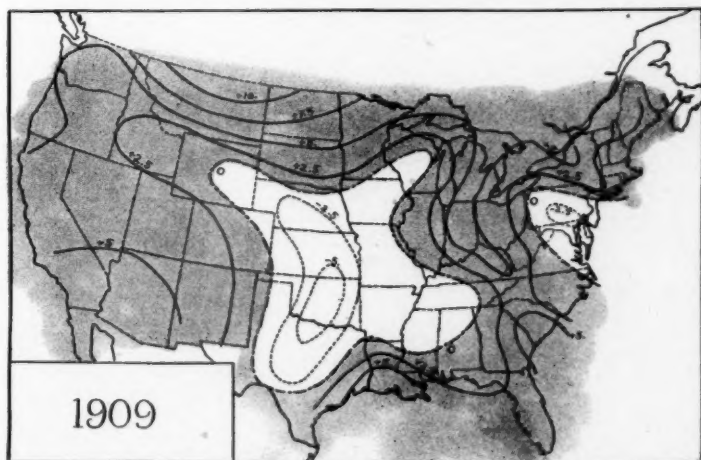


FIG. 15.

tains, where it turns South, is nothing else than the northern branch of the great horseshoe shaped wave surrounding the fat center of the previous year.

The map of 1904 (although very different from that of 1903) suggests a double displacement, from North to South and from East

to West. The same may be said about the map of 1905, that year being distinguished by a fat wave crossing the continent from the Atlantic to the Pacific. If it is again a question of displacement, we may imagine that the lean of the Great Lake Region moved into Montana, Idaho and Oregon, while that which covered California, Arizona and New Mexico, with an extension going as far as Missouri, likewise moved in the same or at least in a south-westerly direction, and that it is the northeastern fat which is now observed in the central part of the continent.

The map of 1906 is that of an extraordinary year, for everywhere, except in Idaho, Wyoming and Louisiana, the departures are positive; but even there the conditions are improved. The lean of the North-West is reduced, likewise that of Louisiana, and the fat simply spread out.

In 1907 the disposition of the equi-departure curves forces us to admit that the lean, which spread over the lake region and into Montana, Utah and Kansas thrust aside to the South-East and South-West the fat centers of 1906: that of Ohio into Tennessee and those of Wisconsin and Oklahoma over into Arizona.

The map of 1908 is not less interesting. The lean remained, but decreased in size and importance. A fat coming from the North-East reduced the eastern portion of the lean. Positive values observed in Wisconsin, the Dakotas and Montana surround it completely in the north. And, the fat remaining in the South-West prevented a downward or retreating movement of the lean towards the South or West. Lastly, the map of 1909 seems to give evidence that the preceding reasonings are not simply speculations.

The differences between the positive and negative values are increased and, at the same time, there is such an analogy in the distribution of the equi-departure curves, that one must admit that the lean of 1909 is the lean of 1908, more concentrated, having been pushed by fat waves from the North and from the South-East against stationary fats in the South and South-West.

The center of the lean moved from Indiana into Oklahoma, the negativity increasing at the same time from  $-4.4$  to  $-7.2$ . The lean in Delaware, on the map of 1908, spread out into New Jersey, Pennsylvania and Maryland. The positive wave which extended from Maine across New York into North Carolina goes now from Indiana to South Carolina.

If we take all the maps into consideration now, and try to classify them according to their general appearance, we may make the following distinctions:



Years of nearly normal conditions, years nearly uniformly good or bad and, finally, years for which the yield of crops is particularly different from one region to another. There are different ways of expressing by figures the state of agitation or anomaly which the maps express graphically. We may note the differences of the highest and lowest departures of the fats and leans, that way taking into account the maximum amplitude of the waves. We may also take the mean value of the departures at all the centers above or below the normal.

Finally, we may add also, for each year, the values for all the departures noted in the different States, without taking into consideration the sign (+ or —) of the departures. For example, in 1901 the greatest departures are —18.5 and +11.5, which according to the first method gives 30.0. By the third method the figure 274.2 is obtained.

Evidently, these figures have no real signification and can only serve as a numerical method of comparing the maps. However, the result to which one is led by making these simple additions is really curious.

The following diagram, which expresses these figures graphically, indeed demonstrates the fact that the degree of perturbation of the maize crop does not change at random from one year to another. We see increasing values from 1891 to 1894 and then a more or less progressive decrease. In 1901 we notice an abrupt increase followed anew by a gradual diminution until 1904, or even 1907, if we consider the value of 1906 as abnormal. But the interesting point is that 1893 was a year of maximum sun-spot frequency, 1901 the year of a minimum and that the following maximum was observed in 1905 or 1907.

Therefore, we see a coincidence of maxima (1894), or an inversion (1901 and 1907). This is just what has been frequently observed in the study of the correlations of meteorological phenomena with sun spot frequency, and this is precisely what so singularly complicates the discussion of the question of solar influence.

To leave no doubt about the fact the anomalies of crops reflect the anomalies of solar radiation, under the influence of climatical variations, I reproduce here below the figures giving the amplitudes of the extreme hyper and hypo-pressure waves, for 1891 to 1899, as they were published in the first of these papers.\*

48, 66, 67, 71, 66, 62, 58, 54, 49.

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\* *Bull. Amer. Geogr. Soc.*, vol. 42, p. 281.

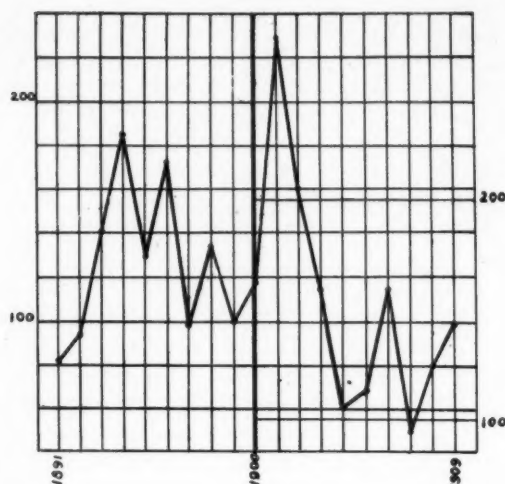


FIG. 16.

The corresponding figures of the corn crops are:

13.2, 9.9, 15.8, 28.9, 18.8, 23.6, 16.6, 13.1, 10.4.

To come back, finally, to the question of the influence of rainfall upon the crops, I will cite the following fragment from a discussion by Cleveland Abbe of a paper by H. C. Russell on the variations of atmospheric precipitation in Australia:\*

"Now, this periodicity, or rather the irregular succession of good seasons and bad seasons, is a fact recognized in every portion of the world. We also have enough data to show that in most cases a drought in one portion of the globe is accompanied by rains in other portions, and the regions of excess and deficiency of rain move over the surface of the globe month by month and year by year."

To my knowledge this last fact has not yet been proven. At present it is but a simple assertion. Considering the close correlation which seems to exist in the United States between the rainfall, during the summer months, and the crop of maize, and considering the enormous commercial importance of this cereal, I will study more in detail the question of rainfall and water resources as soon as circumstances will permit.

New York, January 21, 1911.

\* E. B. Garriott: Long-range weather forecasts. *Weather Bureau*, Bull. no. 35, p. 30. Washington, 1904.

## LIFE ALONG A GRADED RIVER

BY

F. V. EMERSON  
University of Missouri

(Concluded from the September *Bulletin*, pp. 674-681.)

But the very advantage of the meander swinging up to the bluffs at Brunswick carried with it a danger which all towns similarly situated must face. A flood plain meander is not stationary, but moves down the valley. The *filum aquae*, as the law terms it, or the thread of fastest current, does not occupy the middle of the stream, especially in a bend. Typically the fastest current moves as in Fig. 9. The greatest erosion is at the base (AB) of the projecting spur and the

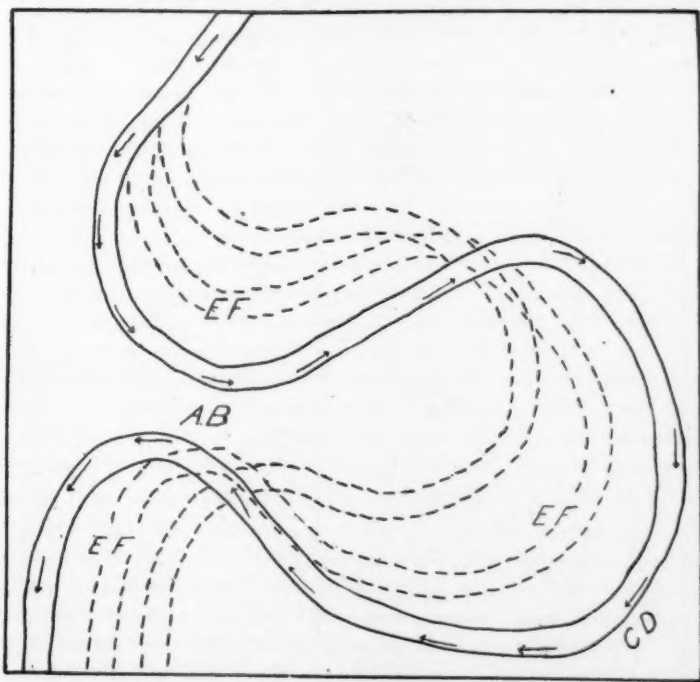


FIG. 9.—Diagram to show the movement of a meander down stream. The broken lines represent former positions of the river. The arrows show the "thread" of the current.

outer and down stream side of the meander (CD). Thus the meander moved past Brunswick and finally about 1874 the river cut through its spur leaving the town several miles inland. The Grand River still occupies the eastern part of the old meander, but the channel rapidly silted up, and Brunswick was effectually shut off from the Missouri. Fortunately this cut off did not occur until the river traffic had become unimportant, and the business of Brunswick did not suffer greatly from the loss of river traffic.

The same danger has constantly threatened Glasgow. It is only by construction of revetments by the government and by reinforcing the embankments of the Chicago and Alton railroad which crosses here, that the threatened cut off has been averted. (Fig. 10.)

When the river begins actively to erode the bank of the bend, it often deposits on the opposite bank, as at E F in Fig. 9. That is the coarser load, mostly sand, which settles in the quieter water. When this occurs the river people say that the river is "throwing up sand banks." Thus construction often, but not always, accompanies destruction. These sand bars at low water become covered by a growth of willows which are often followed by a cottonwood growth. At high water the dense vegetation arrests the silt and fine sand and the bar becomes arable land. Between these bars there are often semi crescentic lakes. The entire region south of Brunswick which was at various times the bed of the river, is now composed of these ridges with the intervening lakes.

The river towns were not destined to hold their prosperity. The maximum development of the river trade occurred between 1850 and 1860. At that time one or more boats might usually be seen at any stretch of the river. In the early sixties, railroads were built paralleling the river and they took away most of the through traffic and much of the local traffic. Branches were soon built to the principal river towns and the boat traffic ceased to be profitable. Brunswick and Glasgow became terminal or division points and did not suffer so severely as many other river towns.

*Agriculture.* The soils of the flood plain are, of course, alluvial and their composition differs according to the velocity of the current by which they are deposited. Where the current was rapid, the soil is largely sand; where it was slower, the soil is a sandy loam or silt. Where the conditions are typical, the soil near the river is sandy and it grades in fineness away from the water through sandy loams, silt loams, to silt and clay. Often old ox bow lakes, the result of cut offs, which are entirely drained may be traced by their accompany-

ing soil types. The old channel is often silt and clay; on one or both sides there may be a low ridge of sandy soil where the overflowing river first deposited its coarse load and from this ridge the soil grades into loam and silt as one withdraws from the old channel. (Fig. 11.)

The clay soil is locally called "gumbo." It is a heavy moist soil usually requiring artificial drainage. When drying it cracks often to the depth of fifteen inches and these cracks intersect each other giving a field a curious columnar appearance. When drained, "gumbo" is fertile soil and yields good crops, especially of wheat. The loams are the valuable lands of the flood plains, and not seldom are worth \$200 per acre. They give large yields of wheat and corn. Sandy tracts are relatively or absolutely barren. Only when they have supported vegetation for several years do they become covered with silt and worth cultivation. However, sandy tracts are often bought very cheap and held in the hope that some flood will cover the surface with silt and thus make it fertile. Often a farmer will point to a field, formerly worthless, which now brings him twenty or more bushels of wheat to the acre. On the other hand, a flood sometimes

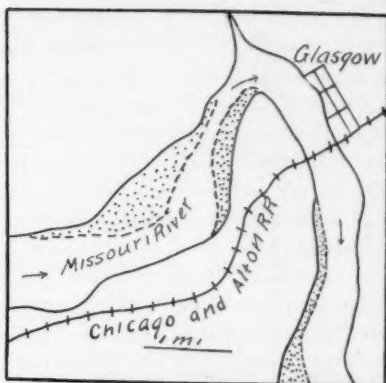


FIG. 10.—Map to show river erosion near Glasgow from 1878-79 to 1880. The dotted areas were eroded between 1878-79 and 1880. (From maps of the Missouri River Commission.)

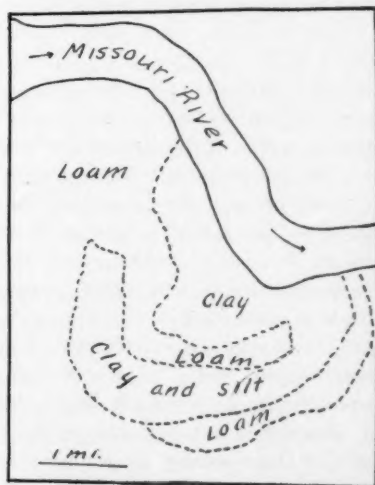


FIG. 11.—Based on Soil Survey of Saline County, Mo., in 1904.

covers a fertile field with sand, making it almost worthless. Again, the floods, especially in June, may stand upon the fields so long as to drown the growing corn and wheat. Finally, there is the constant menace of river erosion, especially in the vicinity of bends. Entire farms sometimes crumble into the river in a few weeks.

The uncertainty is somewhat reflected in the agricultural methods, the land tenure and the social habits of the people. Much of the flood plain is held in large farms which are worked by tenants. The large farms are in many cases survivals of conditions in the preceding generation when lands were cheaper and large holdings common. The good soil is almost inexhaustible and yields good incomes to the owners who often live elsewhere. However, owners of small holdings, and tenants emphasize the uncertain conditions along the graded river. A man with moderate capital hesitates to invest in land which may disappear. The law provides that when the river erodes land, the owner loses all title thereto, even if, in subsequent years, the river should again restore land to the former site. Then again the possibility of crop destruction or of the land being covered with sand are deterrents to the man of moderate capital. Many of the farm buildings are incommodious and in poor repair. There is an indisposition toward making permanent improvements. For the most part, the churches and schools are located on the adjacent higher country as are practically all the villages. As far as possible, the workers on the flood plains live on the higher lands on either side.

*Water Supply and Health.* As compared with the uplands, the problem of water supply on the flood plain is simple. Abundant water is nearly always found by sinking wells to the low water level. At a distance from the river, the water is usually well filtered in passing through the gravel and sand of the flood plain. Open wells are often partially filled with sediment at flood time and all wells are subject to contamination from ground water. However, with reasonable care, the water supply on the flood plain is pure.

Malaria, "the chills," has always been a plague along the flood plain. Time and again its ravages have caused the depopulation of districts and towns. Cox's Bottom was settled before 1820, but a severe epidemic of malaria drove most of the settlers out. Often they abandoned partially cleared farms and cabins to escape the "chills." Old Chariton as we have seen, was laid out in 1817, a short distance from Glasgow, but was abandoned in 1829 largely because of malaria. With better drainage, the malaria is decreasing in most parts of the flood plain.



*Slavery.* Slavery acquired a considerable foothold in Missouri. (Fig. 12.) Its controlling influences were complex but were, to a considerable extent, geographic. Up to 1860 a large majority of the settlers came from slave holding States and brought their slaves with them. The ordinance of 1787 prevented slaves from being taken north of Missouri, and this ordinance was doubtless a powerful factor in deflecting the immigration from Kentucky, Tennessee, Virginia and the Carolinas into Missouri. The climate and soil of Missouri were favorable to tobacco, the principal crop with which the slave owners were familiar. To this crop was added the cultivation of hemp, which was produced in large quantities along the flood plain. These two crops, tobacco and hemp, were the main crops produced by slave labor on the flood plain. To some extent the plantation system was in vogue, and many of these large plantations are still held by heirs of the original owners. Neither tobacco nor hemp is now largely produced in Missouri. They have been superseded by corn and wheat.

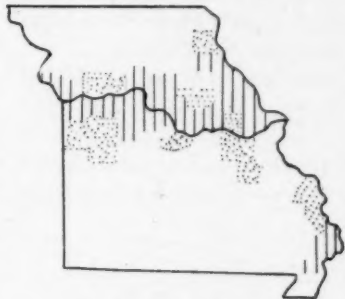


FIG. 12.—Proportion of slave population in 1860. Dots indicate that slaves were 10 to 20 per cent. of population. Parallel lines, 20 to 70 per cent. of population.

*Laws.* The legal responses to the conditions along a graded river are interesting. The high agricultural value of much of the flood plain and the higher value of flood plain land located in cities like St. Louis and Kansas City led to many law suits, and the reports of these cases on Missouri would fill several volumes. As far as this paper is concerned, there are three principles of law that apply to the land along a graded river, namely, accretion, reliction, and avulsion.

The Missouri river being a navigable stream, all land titles end at the water's edge. There can be no private ownership of land beneath the water. The owner of riparian lands is constantly liable to loss of land by river erosion. The legal theory is that, since the owner of such lands assumes the risk of erosion, he is entitled to any deposits which may be made upon his water-front, either by direct deposition (accretion) of the stream or by the streams withdrawing from his water front (reliction).\*

\* American Decisions, Vol. 33, page 276.

However, the accretion or reliction must be "gradual and imperceptible" and not sudden (avulsion). The theory, again growing out of the habits of a graded river, is that if the erosion is "gradual and imperceptible," the property that is swept away can not again be identified.\* If a house, for example, is carried away and deposited on another person's land, the owner can recover the house provided he can identify it. Of course, soil swept away can not in like manner be reclaimed. Another reason for allowing the riparian owner title to the accretions along his water-front is that, otherwise, he would be shut off from access to the river by the accretions in front of his land.†

If land is destroyed by the river, the owner's loss is total even though the site of his property subsequently becomes land. An illustration is to be seen in Jackson County, northwest of the area de-

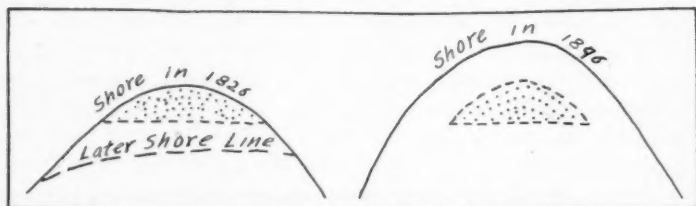


FIG. 13.—The dotted area indicates the land in litigation. (Diagram from Mo. Rept., 173, p. 195, *Whitcombe vs. Chiles*.)

scribed in this paper. Between 1826 and 1853 the Missouri eroded a small tract of land, but by 1896, the river had not only restored the original tract, but had added some 200 acres to the tract. However, the title was lost to the original owner when the land disappeared and it was decided that he had no claim upon the original site. (Fig. 13.)

Islands appearing in the river belong to the State, and have to be bought from the State in order to acquire title to them. Often an island becomes connected with the shore. In such a case the riparian owner does not acquire title to the island, but only to the accretion before his water-front. In a contest as to the ownership of the land connecting an island and the mainland, it was decided that the line of division should be the middle of the abandoned channel.‡

An interesting case involving the habits of the graded Missouri

\* Mo. Repts., Vol. 61, page 1876, *Benson vs. Morrow*.

† Mo. Repts., Vol. 118, page 403, *Crandall vs. Allen*.

‡ Mo. Repts., Vol. 86, page 209, *Buse vs. Russell*.

and the law applying thereto was tried in 1897.\* The case brought out the behavior of the Missouri from 1820 to 1897, a period of 77 years. Holmes Island, about three miles below St. Charles, and about twenty-five miles from the mouth of the Missouri, had, in 1820, a position as shown in Fig. 14. Holmes Island was purchased about 1840. In 1885, in a period of thirty-eight years, this island had almost entirely shifted down stream. The head of the island was washed away by the rapid current and, in the more quiet water on the down stream side of the island, nearly the same area had been deposited. A small island (Case Island), had formed to the northwest of Holmes Island. The situation in 1858 is shown in Fig. 15. Meantime the river was withdrawing from the south bank and leaving a portion of its deposits exposed as land. The main channel was across a part of the former site of Holmes Island.

Case Island was washed away and the north bank of the river was therefore the more exposed to erosion. In 1875-76 the erosion was very rapid, and the main channel rather suddenly shifted to the north of Holmes Island, leaving its old course southwest of Holmes Island practically dry. Holmes Island had, in the meanwhile, shifted still further down stream. (Fig. 16.)

It will be remembered that Holmes Island was bought in 1840. With all of its shiftings down stream the title remained in the original purchaser, and his successors, since the deposits on the lee side of

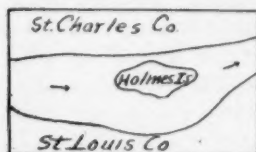


FIG. 14—Holmes Island in 1820.

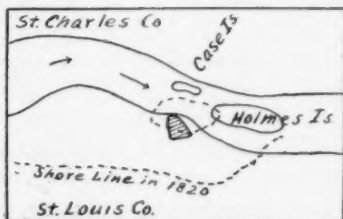


FIG. 15—Holmes Island in 1858. The broken line shows the former position of the island. The shaded area indicates the land in controversy.

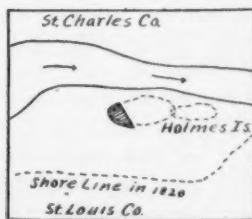


FIG. 16—Holmes Island in 1875.

\* Mo. Repts., Vol. 137, page 271, Vogelameier vs. Prendergast.

the island were gradually formed contiguous to the island and were, in the eyes of the law, accretions. However, the owners of the island tried to hold possession of land which was embraced in the original deeds of the island, but which had been subsequently part of the river channel, and then had been covered by alluvium. (Figs. 14, 15, 16.) In other words, the former owners of the *site* of a portion of Holmes Island tried to hold the site notwithstanding the fact that it had formed a portion of the river channel. This contention was held contrary to law in Missouri, since the owner had lost title to the original site when it became a part of the river bed.

Another application of river law came out in this case. The boundary between St. Charles County on the north and St. Louis County on the south is ordinarily taken as the *filum aquae* or fastest current of the river. However, it was decided that the change of 1875 was so sudden that it constituted a case of avulsion and the county line followed the old bed rather than the new channel. If space permitted many other illustrations of the legal responses to life along the graded Missouri could be given. Many of the reports are extremely interesting when they give a connected history of river activities covering a long period of time.

The statutes of Missouri provide for the drainage of swamp lands in general, which, in this State, are practically confined to the flood plains.\* At present the drainage of such lands is left to the initiative and desire of the local land owners. Upon petition of owners representing a majority of the acres to be benefited, the county court appoints a commission to investigate the drainage project. If the report is favorable and accepted, the commission plans the ditches, dikes, etc., and assesses the land in proportion as it is benefited. As yet no large areas of flood plain land in Missouri have been reclaimed under this plan.

There are many indications that the former importance of the Missouri River as a free, cheap highway may be in part regained. In recent years successful attempts have been made to establish steam boat lines from St. Louis to Kansas City. The movement for inland waterways which has reached almost national importance includes the improvement of this river as one of its projects.

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\* Missouri Annotated Statutes, Vol. 4.

## GEOGRAPHICAL RECORD

### AMERICA

THE TRANSCONTINENTAL EXCURSION OF 1912 AT CRATER LAKE. Mr. J. H. Cuntz formerly of Stevens Institute, Hoboken, who is writing a series of letters to the *New York Times* on the journey of the Society's Transcontinental Excursion, describes in a letter published on Sept. 29, the automobile trip from Medford, Oregon, to Crater Lake National Park. The party traveled on this automobile excursion as the guests of the Commercial Club of Medford. Mr. Cuntz says:

"To get to Crater Lake the party had a fine automobile ride of eighty-five miles, in the course of which they ascended nearly 6,000 feet, and passed through a virgin forest of Douglas fir, yellow pine, and sugar pine, thick-set giants of the forest that aroused the admiration of the foreign members of the party to such a degree that they insisted on stopping at every opportunity to photograph some of the trees. All day, too, the party climbed above cliffs rising from 1,000 to 2,000 feet above the surface of the lake, and rowed on its transparent blue waters which in some places are 2,000 feet deep.

"In the evening the geographers gathered around their campfires, discussed the geographical and geological history of the slumbering lake and the dark, silent region around them. Crater Lake is nearly circular in shape, and has an average diameter of five miles. Its surface is more than 6,000 feet above sea level, and it is completely surrounded by cliffs, which rise in some places 2,000 feet almost vertically. Outside this rim the ground slopes away in all directions, so that the lake seems to be set on the top of a mountain. It is believed, however, that the present mountain is only the lower portion of a far larger one which towered to a height of nearly 15,000 feet and has received the name of Mount Mazama.

"It is supposed that the upper portion of this great volcano was destroyed in some tremendous cataclysm, and that it was probably engulfed, leaving the great hole which was afterward filled by the lake. On this theory, the depression occupied by the lake is not, properly speaking, a crater, but a caldera or pit. Since its formation, several small craters have opened within it, and have ejected lava and built up volcanic cones, one of which now rises 800 feet above the surface of the lake and is called Wizard Island. Some members of the party, however, maintained that the top of the mountain might have been engulfed, and still other scientists thought there might not have been any higher part of the mountain at all, and that the lake occupied what was once the real crater of a volcano."

THE ALASKA-CANADA BOUNDARY. Twenty-three years ago the United States took the first steps towards locating the 141st meridian which, according to the treaty of 1825, was to form the boundary between Russian territory and Canada from the Arctic Ocean to near Mt. St. Elias. In August, the United States and Canada completed the delimitation of this boundary line, 600 miles long, most of the work having been done in the past six years. It was a slow process, for the working season in that high latitude is very short, low water at times greatly delayed the survey parties in reaching the work ground, and the transportation of outfit and supplies was a difficult problem.

The second section of the Alaska-Canada boundary, also about 600 miles long, extends from Mt. St. Elias to and through Portland Channel. After the Tribunal of London settled this boundary dispute in 1904 a Joint Commission was appointed to delimit the boundary. The Commission at once set about identifying peaks which the Tribunal had named as marking the boundary line, fixing their geographical positions, connecting all the boundary peaks by triangulation and carrying on much other essential detail. The surveyors have been in the field for the past seven years and it may take some years yet to complete the work. Heavy snowfall, cutting vistas through dense growth of bushes to bring points of triangulation into view and many other obstacles have delayed the work.

SUMMER EXCURSION OF THE GEOGRAPHIC SOCIETY OF CHICAGO. Glacier National Park was the objective of the third annual summer excursion of this Society. A party of fifteen representing the Society went in by way of Belton, Montana, the western entrance of the Park, under the leadership of Mr. Jesse E. Smith, a former president of the Society. At the head of Lake McDonald, horses and pack train awaited the party and after spending a day at Avalanche Basin the party pushed on into the interior, crossing Gunsight Pass, July 20. A day was spent on Blackfoot Glacier and four succeeding days at points along the chain of St. Mary's Lakes. McDermott Lake was next visited and from the permanent camp there four side trips were made, notably one to Iceberg Lake and another to the top of a pinnacle of the Garden Wall above Swift Current Pass. Leaving the McDermott country the party explored in succession the valleys of Cut Bank and Two Medicine Creeks and followed the course of the latter out of the Park boundary to Midvale from whence the return to Chicago was made.

ASCENT OF MT. SIR SANDFORD. Mr. Howard Palmer writes to the *Bulletin*:

"This year I desired to round out our Alpine work in the Selkirks by capturing Sir Sandford, the highest peak in the range. We made this climb on June 24. In company with Prof. E. W. D. Holway I left Golden, B. C., on June 17, proceeding down the Columbia River by canoe. We employed two local men as packers and canoe men and were accompanied by Edward Feuz, Jr., and Rudolph Aemmer, Swiss guides, making the party six strong. Only the guides and ourselves, however, made the climb.

"The base camp near Sir Sandford Glacier was reached on June 23 after three days of laborious back jacking via Gold River and Palmer Creek (west branch) in unprecedentedly hot weather for this region. A black bulb thermometer in the sun read 144° F. and the shade temperature was 84° F. However, the weather was fine otherwise, though the slopes of Sir Sandford were unusually bare of snow, disclosing the underlying ice everywhere below 10,000 feet. The mountain is 11,634 feet by Wheeler's survey. This rendered the previously tried routes impracticable of ascent and forced us to adopt an exposed path beneath hanging glaciers. The westerly face of the peak, the only one that has yet offered the slightest chance for an ascent, is entirely glacier covered, much resembling the Grand Combin in the Alps. The climb therefore comprised snow and ice work entirely.

"We left camp (about 5,700 feet) two miles from the base of the mountain at 1 A. M., and reached the summit at 11 A. M. On account of the watery condition of the snow owing to the bright sunlight, the descent was begun at once, as a long traverse of a cornice along the summit ridge, fully exposed to the direct rays, had to be made. Camp was regained at 4.30 P. M. Besides many crevasses, the chief difficulty was presented by these cornices overhanging the ridge on both sides, and the slushy state of the snow.

"Although, according to modern mountaineering standards, the peak would doubtless not be ranked as difficult for an experienced party, yet decided elements of danger will scarcely ever be absent from the climb. Sir Sandford has been the goal of no less than eight attempts to scale its icy fastnesses during the last half dozen years, not counting the successful expedition. No other peak in the Canadian Rockies is known to the writer to have such a record. Only five of these have reached even the base of the mountain, and aside from our parties, only one, that of Mr. Culver of Winnipeg, in 1911, has actually set foot on the peak itself.

"Two days later, June 26, the same party ascended Mt. Adamant, northwest of Sir Sandford, just short of 11,000 feet in altitude. This climb was of an entirely different character, being mostly rock work. For ten hours the climbing was necessarily continuous owing to stormy weather. The only break was fifteen minutes at the summit. This mountain proved much more difficult, if safer, than Sir Sandford and consumed eighteen and a half hours, the return to camp being at 1 A. M. in a severe thunderstorm.

"Only a limited amount of scientific work could be accomplished. The Sir Sandford Glacier's surface motion was again determined in the hope of show-



ing a different rate under hot weather conditions, but after the marks were set it unfortunately turned cold—even more so than at the time of the first determination, and the rate was slower. The forefoot had retreated about forty feet since 1911. Some additional survey work was accomplished to connect with previous results of the government triangulation. Numerous photographs were secured but two weeks of incessantly stormy weather forced a return with less accomplishment than was hoped for."

**GROWTH OF A NEW CANADIAN TOWN.** Although the track on the Grand Trunk Pacific Railway is still many miles distant from the town of Fort George on the upper Fraser River, few towns in western Canada are developing so rapidly. Fort George now has a population of over 1,500 people; two hotels, two dry goods stores, three lumber companies and a sash and door factory. The *Fort George Tribune* has been changed from a weekly to a daily paper, and all homesteads have been taken up within a radius of eight miles. Track laying on the Grand Trunk Pacific west of the Rocky Mountains on the way to Fort George is now proceeding on an average of over a mile a day and the steel reached Tête Jaune Cache early in July. This point is 1097 miles west of Winnipeg.

**CLIMATE OF PORTO RICO.** The climatic conditions of Porto Rico are being studied in detail by Dr. O. L. Fassig, Section Director of the United States Weather Bureau at San Juan. The increasing importance of this island, with its favorable location in the trade wind belt, its high elevations, and its agricultural possibilities, gives such an investigation an economic significance which it has not had until the present time. Characteristically uniform are the temperatures. The mean annual for the whole island is 76°; the coolest month averages 73°, and the warmest, 79°. In ten years the mean annual has varied only 1° above and below 76°. These are averages for the whole island. The towns on the coastal plain have somewhat higher means, while those along or near the summit of the main divide have lower means. The diurnal ranges are comparatively large. On the coast they average 10° or 11°. Inland, they vary from 20° to 25°. The maxima reach nearly 90° in summer on the coast, and the minima fall to about 66° in winter. In the hills, the maxima and minima are somewhat lower (87° and 61° in summer and winter, respectively). There are no well-defined rainy and dry seasons. The winter rains are comparatively light, with a minimum in February at nearly all stations. The maximum is usually in September on the east coast; in October on the south coast; in November on the north coast, while on the mountains of the interior it is in summer. The rains are usually of short duration, not more than 10 or 12 minutes on the average. Tropical and extra-tropical cyclonic rains are of comparatively rare occurrence. The mean rainfalls for the whole island by seasons are, winter, 11 inches; spring, 16 inches; summer, 23 inches; autumn, 26 inches. The physiological effects of the high relative humidity are largely counteracted by persistent flow of the trades. The constancy of these winds is remarkable. The variations in direction are from northeast to southeast, with a decided preponderance from east southeast. The average hourly velocity varies very little throughout the year. The summer thunderstorms are not severe, and attract little attention. Porto Rico is singularly free from the severer type of tropical cyclones (*Annals Assoc. Amer. Geogr.*, Vol. I).

R. DEC. WARD.

**IMPROVEMENTS IN THE HARBOR OF CURAÇAO.** In a letter addressed to the Society, Mr. W. C. L. Zelle, the Director of Public Works of the Island of Curaçao says that work has been started to deepen the harbor entrance at Willemstad by dredging over a width of 263 ft. to a minimum depth of 34.5 ft. below sea-level at ebb-tide. Steps are also being taken to light the harbor adequately so that vessels may enter or leave by night with as much safety as during the day-time.

**THE POPULATION OF CHILE IN 1910.** The population of Chile on Dec. 31, 1910, was calculated by the "Oficina Central de Estadística" to consist of 3,415,060 inhabitants. This number is distributed as follows for the different provinces: Tacna, 42,925; Tarapacá, 115,940; Antofagasta, 118,718; Atacama, 65,118; Coquimbo, 178,731; Aconcagua, 132,730; Valparaíso, 299,466; Santiago, 546,599; O'Higgins, 94,257; Colchagua, 159,421; Curicó, 108,120; Talca, 132,730;

Linares, 111,773; Maule, 115,568; Nuble, 169,858; Concepcion, 225,054; Aranco, 62,259; Bio-bio, 100,495; Malleco, 113,020; Cautin, 161,935; Valdivia, 131,751; Llanquihue, 113,285; Chiloé, 91,657; Territorio de Magallanes, 23,650.

The number of births in 1910 is given as 130,052, of which 66,741 were males. The excess of births over deaths in 1910 amounted to 23,979.

THE EIGHTEENTH INTERNATIONAL CONGRESS OF AMERICANISTS. This Congress was held at the University of London, May 27-June 1, under the Presidency of Sir Clements R. Markham. It was attended by 150 foreign members. Some of the papers were of geographical interest. The following information is condensed from the *Geographical Journal* (Vol. 40, 1912, No. 3, pp. 318-320).

Waldemar Jochelson, of St. Petersburg, described the work of the ethnological section of the Riabushinsky Expedition sent under the auspices of the Imperial Russian Geographical Society, in 1908, to the Aleutian islands and Kamchatka. His party were occupied in field work there for three years, and studied the folklore of the Aleuts, their physical type, and their language, which is of Eskimo origin. Thirteen ancient village sites and some huge shell-heaps were excavated, and implements, weapons, ornaments, and other prehistoric objects of stone and bone were found in them. In Kamchatka, in the old underground dwellings and fortifications, the existence of pottery (which had been denied by former travelers) was ascertained. The mythology of the Kamchadal proved to be identical with that of Northwest America, and there is a morphological relation between the language and those of some American Indians.

Mr. J. A. Mason, a Fellow of the International School of American Archaeology and Ethnology in the City of Mexico, spent four months last winter among the Tepecano or Tepehuán at their village Azequeltán in the great barranca of the Rio de Bolaños, which borders the states of Zacatecas and Jalisco, in order to study the remnant—less than one hundred of sufficiently pure blood—of this people, who claim to be descended from the more ancient inhabitants. Their religion is closely related to that of the Huichol and Cora, and the ceremonial feasts and preparation of symbolic objects form a prominent part in their lives. Formerly, "from Arizona to Jalisco, a stretch of 1,000 miles along the ranges of the Sierra Madre, there lived peoples speaking the closely connected Pima and Tepehuán languages. Together with these are found other languages, such as Tarahumare, Yaqui, and Opata, undoubtedly connected, but probably differing considerably. There are great ethnological differences between such extremes as the Pima in Arizona and the Tepehuán."

Jonkheer L. van Panhuys gave an account of the Sixth "Surinam" Expedition sent to explore the interior of Dutch Guiana, in the autumn of 1909, up the Surinam river. Near the source of one of its branches, the Gran Rio, the head of a stream leading to an unknown region was discovered. This proved to be an affluent of the Corentin, and was followed down by the expedition.

Dr. K. T. Stoepl was asked by the Berlin Museum of Ethnology, in 1911, to investigate the ancient remains at San Agustín, on the upper waters of the Magdalena in Colombia. Massive stone coffins over 6 feet long, in vaults of almost modern type covered by artificial mounds, gigantic statues, and a remarkable chamber with sculptured stone door-jambs were discovered, and further search will doubtless be fruitful of results. Dr. Stoepl brought away many photographs and drawings.

## AFRICA

CHANGES OF CLIMATE WITHIN HISTORIC TIMES IN NORTHERN AFRICA. A noteworthy discussion of a much-debated question is Dr. Hermann Leiter's "Die Frage der Klimaänderung während historischer Zeit in Nordafrika" (*Abhandl. Geogr. Gesells. Wien*, Vol. 8). The author has examined the literature, old as well as recent, in connection with this investigation. His presentation of the present climatic conditions of northern Africa is one of the best published. This is followed by an account of the climate of the region in ancient times, based upon details of stream flow, flora, fauna, human habitations, and the like. Finally there comes a statement of our present knowledge of the causes of climatic oscillations.

The author reaches the conclusion that there is no evidence of any change in temperature. There has been no change in seasonal distribution of rainfall. The rain probability may be somewhat larger now. There are no reports of such snowfalls along the borders of the desert in ancient times as have taken place recently. There has been no change in the flow of water in the rivers. Vegetation and agriculture show nothing which cannot be explained by a decrease in human activity. There is no reason for assuming any deterioration of climate on the basis of change in the fauna, or in the disappearance of the large mammals. This happened as the result of human intervention. The denser population of former times was possible because the people worked harder to secure and to utilize the water. There was no greater humidity in ancient times than now, judging by the old descriptions of the desert, its extent, and its relation to traffic. Evidences of a greater degree of moisture at present may be explained as the result of climatic oscillations. The widespread belief in an increase of temperature and of dryness within historic times is not only not susceptible of proof, but there is evidence to the contrary.

R. DEC. WARD.

### ASIA

INDUSTRIAL EDUCATION IN THE PHILIPPINES. Recent reports published by the U. S. Bureau of Education say that great progress under American teachers is being made by the Filipinos in the field of industrial training and useful arts. In some lines, particularly in lace-making and embroidery the products of the Philippine schools compare favorably with French and Swiss products. The Philippine system of education, as American teachers have shaped it, is based on the principle that the children should be trained for their life work. Nearly 400,000 school pupils are engaged in some kind of industrial labor. This instruction begins in the primary grades both for boys and girls and the work is carried on in an advanced stage in the intermediate schools. Twenty-six well-equipped trade schools have been established in Manila and other parts of the Philippines. A college of engineering has been added to the University of the Philippines and a College of Agriculture is established at Los Banos.

RESULTS OF THE ABOR EXPEDITION. The expedition sent out by the Government of India in 1911 to punish the Abors who murdered English and Indian explorers did not accomplish its main purpose as the supplies were insufficient and it was also impossible to follow the natives into their most remote mountain fastnesses. Neither did the expedition entirely solve the problem of the identity of the Sangpo River of Tibet with the Dihong-Brahmaputra as the expedition was unable to advance far enough north, though it explored a part of the hitherto unknown stretch of the river. There is no doubt, however, that the two rivers are identical. Several large snowy peaks were fixed by the surveyors on what appears to be the main Himalayan Divide, including one very fine peak of over 25,000 feet. Many more snowpeaks were also fixed on the watershed between the Dihong and Subansiri Rivers. A survey of an area of thirty-five square miles, mapped on a scale of four miles to an inch, gives some idea of the general topography of the snowy ranges.

### EUROPE

THE ROYAL GEOGRAPHICAL SOCIETY'S NEW HOME. It is announced that the Royal Geographical Society has bought Lowther Lodge and its grounds for its new premises. The price paid for the property is £100,000. Lowther Lodge was built at Kensington Gore by Mr. Norman Shaw for the father of the present Speaker of the House of Commons. The construction of the building is excellent, and it is in perfect condition. The internal arrangement is such that with little change the premises will, at an early date, be suitable for the purposes of the Society. The reception rooms on the ground floor will provide accommodation for a museum, a map room, a council room, a reading room, and a secretary's office. On the first floor, overlooking the gardens, are some fine rooms suitable for a library, while close to them are others which will be used as reading, writing, smoking, and tea rooms. Above these are rooms affording

ample accommodation for the Society's school of instruction, the map draughtsman, and other officials of the Society. The house has a good basement and extensive attics, which will provide storage for books or maps sufficient to meet requirements for many years.

Attached to the house are two acres of garden ground. It is probable that the Society will part with as much of this land as is necessary to enable it to build a hall large enough to hold a thousand persons. The lack of such a hall has been for many years a cause of great inconvenience. The new premises are, it is true, at some distance from the present offices of the Society. This disadvantage, however, is more than counterbalanced by the fact that the building is in a quarter of London where much scientific work is going on, and is also easy of access from all parts of the West End. The Society has sold its present house in Savile Row at a satisfactory price, and with the money thus obtained and other funds is able to defray most of the expenditure necessitated by the purchase. It desires, however, to take possession of Lowther Lodge without incurring any financial liabilities, and an appeal is therefore about to be made to the Fellows to subscribe to the cost of the new premises, upon the occupation of which the Society will probably enter in the beginning of next year. (*Scott. Geogr. Mag.*, Vol. 28, 1912, No. 9, pp. 480-81.)

**HIGHEST FLIGHT ON RECORD.** The Paris correspondent of the *London Times* (weekly edition, No. 1863, Sept. 13, 1912) says that the airman Garros in a Blériot monoplane ascended from Houlgate, twelve miles from Trouville, on Friday afternoon, Sept. 6, and attained a height of 16,405 feet, thereby beating the previous highest flight achieved by Lieut. Blaschke with a passenger at Vienna on June 29. This astonishing achievement is all the more thrilling from the fact that Garros's motor broke down at the summit of this climb, so that he had to return to earth in one huge *vol plané* of over 16,000 feet. Garros landed at a place twelve and a half miles inland from Houlgate.

**PHYSIOGRAPHIC NOTES ON THE BERICI HILLS, ITALY.** Under the title of "La Regione dei Berici," the Italian Hydrographic Office has issued its publications No. 28 and 29 under a single binding. The work covers investigations on the morphology, hydrography and geology of this uplift and was undertaken mainly for the purpose of determining the district's water supply. The region is of special interest to the student of the earth's major tectonic features owing to its relation to the Venetian ranges, themselves forming part of the European Altaides as a portion of the westernmost southern marginal or Dinaric arc.

The Berici hills lie some 70 kms. W. of Venice, and extend almost 20 kms. to the south of the town of Vicenza. The area they cover is about 200 sq. kms. Their relief is due to a domical uplift of a series of strata extending from the Upper Cretaceous to the Lower Miocene. The range presents a festooned front to the north and is divided roughly into an eastern and western section by the Val Lione on the south and the Fimon basin on the north. The eastern section consists almost entirely of an undulating plateau which merges gradually with the plains lying north and south of it. On the east and west this section is isolated by precipitous slopes. The highest peaks are to be found within this area. These are M. Tondo (421 m.) M. Zengia (431 m.) M. Alto (444 m.). The western section is an elongated narrow band, the apex of which may be said to lie at S. Gottardo, at a height of 408 m. From this point it slopes gradually downwards until the whole uplift merges insensibly with the plains environing Spessa. North of San Gottardo a projecting spur of low relief extends almost to the town of Vicenza where the altitude decreases to about 160 m.

The notes taken on the field led the observers to infer that the Berici hills taken together with the Montegaldia and the Euganei hills may be considered as the remotest and weakest folds of the folding by which the most recent Tertiary formations were brought to light.

A study of the region's geology seems to bring out the fact that these hills were submerged during the Upper Oligocene beneath a relatively shallow sea in the bottom of which frequent explosions occurred. The physical and biological conditions prevailing at that time were in many respects like those observable to-day in Polynesian waters.

LEON DOMINIAN.

CITIES IN THE RUSSIAN EMPIRE WITH MORE THAN 100,000 INHABITANTS. The Russian Empire has now thirty-two cities each with more than 100,000 inhabitants. Fifty years ago, in 1862, there were only five cities with more than this population. These were St. Petersburg, Moscow, Warsaw, Odessa, and Riga. The present great cities of the Empire with their population are as follows:

St. Petersburg .....	1,907,000	Helsingfors .....	144,000
Moscow .....	1,618,000	Tula .....	132,000
Warsaw .....	848,000	Kishinev .....	131,000
Odessa .....	540,000	Samara .....	125,000
Kiev .....	501,000	Irkutsk .....	112,000
Lodz .....	385,000	Minsk .....	110,000
Riga .....	350,000	Vladivostok .....	108,000
Kharkov .....	225,000	Orenburg .....	105,000
Saratov .....	205,000	Tomsk .....	105,000
Baku .....	202,000	Nizhni-Novgorod .....	104,000
Vilna .....	200,000	Nikolayev .....	104,600
Tiflis .....	200,000	Kokand .....	103,000
Tashkent .....	188,000	Namangan .....	103,000
Rostov on Don .....	160,000	Dvinsk .....	101,000
Yekaterinoslav .....	150,000	Omsk .....	101,000
Astrachan .....	148,000	Yelisavetgrad .....	100,000
Kazan .....	145,000		

(*Geogr. Zeitschr.*, Vol. 18, 1912, No. 8, p. 468.)

#### POLAR

THE GERMAN ARCTIC EXPEDITION. Next spring a German Arctic expedition is expected to sail north for the reexploration of the Northeast Passage. According to *Petermanns Mitteilungen* (Vol. 58, 1912, August, p. 294), the leader is Lieut. Schröder-Stranz and the scientific staff will consist of Dr. Max Mayr of Munich (geography and geology), Dr. Rüdiger, Rostock (oceanography), Dr. E. Detmers, of Hanover (zoology), and Dr. Wenke, Berlin (botany). Meteorological and physical studies and investigations in terrestrial magnetism will be carried on by Capt. Ritscher and Lieut. Sandleben of the ship's officers. The commander of the ship will be Capt. Berg, who has made numerous journeys in the waters of North Siberia.

The chief purpose of the expedition is to make a thorough study of the Northeast Passage. If conditions are favorable during the first winter season, the interior of the Taimyr Peninsula will be explored; or possibly a detachment from the ship will spend the summer there while the ship is engaged in oceanographic work, coast surveys, and the study of coastal islands. The expedition expects to spend three summers in the thorough exploration of the entire Northeast Passage and to return home by way of the Pacific and Atlantic Oceans. Most members of the expedition have been spending the past summer in Spitzbergen for training in ice work and testing the scientific instruments. *Annalen der Hydrographie und Maritimen Meteorologie* (Vol. 40, 1912, No. 9, 449), says that the firm of Stocks & Kolbe is building a first-class Polar exploring vessel for the expedition. The cost of the enterprise will be about \$400,000.

METEOROLOGY IN SPITZBERGEN. Dr. Hergesell, in the summer of 1911, established a meteorological station in Spitzbergen for the purpose of making observations extending over a whole year. With pilot and captive balloons and kites, records up to a height of 7,000 meters were secured. Dr. Rempp and Dr. Wagner who were in charge of the station also took an unbroken series of magnetic and seismic observations. The work is to be continued for another year.

M'CLINTOCK'S FAMOUS YACHT. The little vessel *Fox*, one of the most renowned of Polar ships, recently sank on the west coast of Greenland. (*Deutsche Rundschau f. Geogr.*, Vol. 34, 1912, No. 12, p. 589.) It was the *Fox* that carried Capt. M'Clintock and his party in 1858 westward along the channels of the Parry Archipelago to winter quarters in Bellot Strait. In the spring of 1859

sledging parties from the *Fox* discovered on the west and south coast of King William Land skeletons and articles that told the terrible tale of the fate that had befallen the Franklin Expedition. No later expedition discovered anything that threw much further light on the fate of the party, though more relics and testimony from Eskimos were secured, particularly by Schwatka.

**DR. BRUCE'S SPITZBERGEN EXPEDITION.** Dr. W. S. Bruce, the Polar explorer, has returned to his home near Edinburgh from his surveying expedition with Dr. R. N. R. Brown in Spitzbergen. The *London Times*, says the explorers, made a detailed topographic survey and a general geological investigation of the region they traversed. They traveled from Bjona Haven to Advent Bay by a new overland route in which it is believed foxes, ptarmigan, and other game once abounded. In their journey of nearly sixty miles they saw no game but only skeletons. Dr. Bruce strongly condemns the wholesale extermination of animal life which is being carried out in Spitzbergen by gun, trap, and poison. He says Norwegian hunters habitually prepare poisoned bait for bears, foxes and other animals. Strict measures should be taken to protect the fauna of Spitzbergen which is now being rapidly and ruthlessly destroyed. He mentions the important development of the coal mines in which American capital and enterprise are chiefly engaged and of other mining activities, financed by British capital. The Norwegians are developing means of communication by post and wireless telegraphy.

#### GENERAL

**NEW GEOGRAPHICAL PUBLICATION.** Under the name of *La Geografia*, the Istituto Geografico de Agostini issued at Novara, in June, the first number of a bimestrial publication devoted to the interests of geography. The aim of the publishers is to render their bulletin especially interesting to teachers and students of the science, and to contribute to the improvement of educational methods in Italy. Special articles will also be printed on geographical and kindred topics and much attention will be paid to cartography and economic and commercial geography. The editors are Messrs. Albino Machetto and L. F. de Magistris. Both are well known to Italian geographers. The cartographic section has been entrusted to Mr. Achille Dardano who has won well-merited distinction as a cartographer in his own country and abroad. With these men and under the auspices of the Istituto Geografico de Agostini there is no doubt that this publication will usefully cooperate in the spread of sound geographic knowledge in Italy.

**THE ANTIQUITY OF MAN.** Professor A. Keith in a lecture in London on "Modern Problems relating to the Antiquity of Man" said he could not cite a more stalwart representative of the orthodox opinion to-day than Professor Boyd Dawkins, who held that man was evolved during the Pleistocene period, and was therefore, from a geologist's point of view, a recent addition to the earth's fauna. A moderate figure for the duration of the Pleistocene period was 400,000 years, and it might be taken as the orthodox opinion that the dawn of the very earliest form of humanity lay 400,000 years behind us, and in that time man as he was now known had been evolved from a crude, almost prehistoric form. Taking the view of M. Rutot as representative of modern heterodoxy, he pointed out that if his claim to have traced man by means of his eolithic culture through the long Pliocene and Miocene periods, and even into the Oligocene period, were admitted, on the estimates of Professor Sollas, which were disputed by M. Rutot, the antiquity of man must be placed at over 3,000,000 years.

The problem of man's antiquity was not yet solved. The picture he wished to leave in their minds was that in the distant past there was not one kind, but a number of very different kinds of men in existence, all of which become extinct except that branch which had given origin to modern man. On the imperfect knowledge at present at disposal it seemed highly probable that man as we know him now took on his human characters near the beginning of the Pliocene period. How long ago that was must be measured by the changes which the earth and living things had undergone, and yet it was only human to try to find a means of measuring that period in a term of years, and the estimates at hand gave an antiquity of at least a million and a half of years. (*The London Times*, weekly edition, Sept. 13, 1912.)



## GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

### BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

#### NORTH AMERICA

**California, its History and Romance.** By John S. McGroarty. 393 pp. Ills., index, appendices. Grafton Publishing Co., Los Angeles, 1911. \$3.50. 9½ x 6½.

We fear that the purpose of this volume is to become a part of the world's fair which is projected for the Pacific Coast upon the completion of the Panama Canal; otherwise it would be difficult to account for the odd mixture of enthusiastic description and somewhat arid statistics. For those to whom access is not convenient to the work of Hittell and Bancroft this volume offers a narrative of the history of California down to the time of the great discovery of gold and the creation of the State. The author devotes considerable attention to the Bear Flag Republic, an act of undisciplined sovereignty which in California tradition is vested with a halo of romance not wholly borne out by the sober facts of pioneer roughness. It is usual, and really pardonable, for Californians to overwrite when their theme is their Golden State.

WILLIAM CHURCHILL.

**The Conquest of the Cœur d'Alenes, Spokanes and Palouses.** The Expeditions of Colonels E. J. Steptoe and George Wright against the "Northern Indians" in 1858. By B. F. Manring. 280 pp. Ills. John W. Graham & Co., Spokane, Wash. \$1.25. 8 x 5½.

This is a detailed account of one of the many romances that make the history of early days in our West. The scene is in the neighborhood of Fort Walla Walla and the year was 1858 when the far west was in a turmoil. The main theme centers around the expeditions of Col. Steptoe and Col. Wright into the country of the Cœur D'Alenes, Spokanes and Palouses. The early chapters relate the story of the march of Steptoe to the north to quell the excitement among the Palouse and Spokane Indians and to offer protection to the scattered population. The engagement of his command with the Indians at Tohotonimme, the withdrawal of the forces to "Steptoe Butte" and the retreat during the night are told with little color and presumably with great accuracy. Upon Steptoe's return, it was deemed necessary to subjugate the northern Indian tribes, and Col. Wright was despatched for this purpose. The last part of the book is an account of his expedition and its successful issue. At the end of the volume are biographies of Col. Steptoe, Capt. O. H. P. Taylor and Lieut. William Gaston, the two last being officers who were killed in the Steptoe expedition.

While the book records interesting events in Indian warfare, it is not presented interestingly. The story has been gleaned from correspondence between headquarters and the field staff and from official records of Indian treaties. Many of the letters are copied verbatim and the reader, to get the story, has to read a large amount of official correspondence.

ROBERT M. BROWN.

**Fifty Years in Oregon.** Experiences, observations and commentaries upon men, measures, and customs in pioneer days and later times. By T. T. Geer. 536 pp. Ills. Neale Publishing Co., New York, 1912. \$3. 9 x 6.

An autobiography of a man now past sixty years of age who has been closely identified with the political life of Oregon as member of the legislature and as Governor must also of necessity be, to a large degree, a history of Oregon. Born in 1851 of pioneer parents at a time when Oregon was a home for missionaries or employees of the Hudson Bay Company, the early life of Geer was spent under the influence of the brave men and women who battled with primitive conditions in a new land. The opening chapters tell the story of the accession of Oregon as a territory of the United States; and like a true Oregonian, he has nothing but derision for the early opponents of the acquisition of the northwest. He pays high praise to the missionaries of the Methodist Church and the struggles of their leaders are recounted with sympathetic insight into the work and the sacrifices that were made. The beginnings of Willamette University, coincident almost with the coming of the white men, and its growth through the years, illustrate the story of the educational progress of Oregon. One of the interesting features of the book is the diary kept by a pioneer woman as she crossed the plains in 1847. The first date is April 21, 1847, written at La Porte, Ind., and the record for a while is a brief statement of the distance covered each day and the condition of the weather; but as the stranger conditions of the high plains and the mountains were encountered the account becomes fuller and more descriptive. The last record given is for February 24, 1848, near Portland, Ore.

The author recounts, with much humor, his "breaking into literature and politics" by an editorial he wrote for a newspaper. From that time his life was bound up closely with the political activities of Oregon. A review of the territorial government, the admission of Oregon to the Union, the situation and issues during the civil war, the presidential campaign of 1868, the writer's service as a member of the lower house in the legislature are given. Then comes the account of his stewardship as Governor of the State. He is a loyal son of Oregon and his story is imbued with spirit and vigor.

ROBERT M. BROWN.

**The Yosemite.** By John Muir. x and 284 pp. Maps, ill., index. The Century Co., New York, 1912. \$2.40. 8 x 5½.

This book represents many years of research by a naturalist. It will probably take its place as the authoritative guide to the Yosemite region. In 1868, John Muir visited this famous valley for the first time. The book opens with a description of the region, the cañons and falls, first when they are bordered by ferns and flowers and again when the winter gives to the valley a wholly different aspect. A paragraph on the rainbows seen at the Bridal Veil and Vernal Falls contrasts with another describing the enchantment of the valley when the moon lights the ice-coated borders of the falls. One phase of the valley is noted in an account of the extraordinary storm and flood of 1871; another, in the description of snowstorms and avalanches. Not every man who has been caught in an avalanche could say that "this flight in what might be called a milky way of snow-stars was the most spiritual and exhilarating of all modes of motion I have ever experienced." The book is a guide also to trees, flowers and birds; and it outlines the geological history and especially that of the ancient Yosemite glacial invasions.

The tourist will be certain to read the chapter on how to spend one's time in Yosemite. Two one-day excursions, two two-day excursions, a three-day excursion, an excursion to the Upper Tuolumne and a number of short carriage trips are outlined. The history of the occupation of the valley begins with the difficulties between the Indians and the pioneers during the gold rush of 1849-50 and ends with the establishment of the Yosemite railroad. A tribute is paid to two good old pioneers, Lamon and Galen Clark, who saw and knew most of the phases of the noted valley. The book ends with a description of the Hetch Hetchy Valley.

ROBERT M. BROWN.

**The Kentucky Mountains.** Transportation and Commerce, 1750 to 1911. A Study in the Economic History of a Coal Field. By Mary Verhoeff. Vol. 1, xiii and 208 pp. Maps, ills. John P. Morton & Co., Louisville, Ky., 1911. \$5. 12½ x 10.

In a stately volume we have here a demographic study of particular interest. Long neglected, the society of the Appalachians is now coming into study and a rich harvest is being gathered by the historian and the sociologist. For her central theme Miss Verhoeff has selected the highway system of the mountains, their development under the stimulus of social needs and their strict accord with geographical conditions of the barrier mass. From this introduction she passes to a detailed study of each of the main highways with its feeders and cross links and discusses the effect which each has had upon tributary territory. At every point she discusses the relation and interrelation of the several elements, the Indian trail following the path of least resistance or the trail which promised the richest reward to an animal-slaying nomad, the riverine paths which opened the way for pack-animal and later for wheeled transport, the settlement conditioned by the nature of the soil to which each such path gave access. In the end she discusses the decadence of the old highways when newer methods of transportation established conditions with which these ancient paths could not compete. It is a most complete monograph, it cannot fail of interest to those who enjoy the view of forgotten nooks of our country.

WILLIAM CHURCHILL.

### SOUTH AMERICA

**In den Wildnissen Brasiliens.** Bericht und Ergebnisse der Leipziger Araguana-Expedition 1908. Von Dr. Fritz Krause. viii and 512 pp. Maps, ills., index. R. Voigtländer, Leipzig, 1911. Mk. 12. 9½ x 7.

The region traversed by this small but excellently conducted expedition lies in close proximity to the meridian of 50° W. through nearly 25° of latitude, between Pará and Santos. It supplies us with fresh information from the states of Pará, Matto Grosso, Goyaz, São Paulo and Minas Geraes. The opening section of the volume, the diary of exploration, is very personal, a careful record of Dr. Krause far from Leipzig set in the heart of the Araguaya country. After one recovers from the feeling of objection to the personal pronoun (and *ich* does not produce quite the effect of I), there is much to be said for this manner of record. In mathematics one would think of it as tending to establish the personal equation, a factor that must enter quite as largely into ethnographical research. We are thus able to weigh the results presented impersonally in the larger half of the work where the author records very carefully worked out notes upon the Indian population of the region. It is a very inspiring record. The observation has been keen and successive observations are very carefully associated. There results an appearance of precision and breadth which in itself establishes the value of these studies. It is agreeable to find that in the elaboration of the economics of the savage life which passed under his examination the author has by no means neglected the topic of amusement. Experience has shown that the savage is not the solemn person he may seem when in the presence of the intruder. Those of us whose lot has for years been cast with primitive peoples have had to learn that life at the bottom of the scale is quite as much a game as it is a struggle. The fuller the record we possess of the sports of the wild the better we shall be equipped to approach the topic of the psychology of immature races, a topic which now clamors for examination. In the not inconsiderable nook of earth in which Dr. Krause has been busy his record of the amusements and the toys of the Indians will long be cited as basic information.

WILLIAM CHURCHILL.

### AFRICA .

**Africa of To Day.** By Joseph King Goodrich. xvii and 315 pp. Map, ills., index. A. C. McClurg & Co., Chicago, 1912. 7½ x 5.

Like a somewhat larger work "Actual Africa," by Frank Vincent, this book

purports to give a semi-popular account of the conditions and problems of the once "Dark Continent." Like the earlier work, the book is both entertaining and instructive. The author has successfully woven in enough history and tradition to touch off his up-to-date pictures and to show that the physical conditions operating in present day problems have been factors throughout the ages.

After a brief but informing presentation of the various sections of the continent—Northern Africa, The Desert, Oases, Egypt of the Ancients and of Today, The Nile, Central, Eastern, Western and Southern Africa, the discussion turns to several general questions of pertinence. His description of the desert is excellent, and his discussion of oases very informing.

In his discussion of "The Blacks in Africa," he says that they are inferior to the whites in many ways, but keener in some ways; and the conclusion is that the blacks should be elevated for what they are worth by concerted action of governments, merchants and teachers.

In "Everybody's Africa" the scramble for territory is described and the present partition outlined. An extensive bibliography is appended.

G. D. HUBBARD.

**Entre le Niger et le Tchad et à l'Est et au Nord-Est du Tchad.** Par

G. Garde. 284 pp. Maps, ills. A. Hermann et Fils, Paris, 1911.

This is one of the recent contributions destined to throw some light on that portion of north-central Africa lying east of the river Niger and beyond lake Chad, roughly to meridian 17° east of Greenwich. The author investigated it in the course of his field work as a member of the Tilho boundary commission (1906-1909). He treats the subject from the geologist's standpoint. As usual, however, the geologist has to depend to some extent on purely physiographic facts for the elucidation of geologic problems. As a result, two sets of data are available for the sifting of a few geographic notes.

The work is divided into two main parts. The first refers to the district beginning at the Niger's east bank and extending to the lake Chad basin. The second deals with this lake and the hydrographic system related to it. A brief allusion is also made to the interesting alkaline rocks of the Zinder and Mounio districts. The first part is subdivided into two parts, of which one is a description of the physical geography of the region while the other is restricted to its descriptive geology. Due importance is granted here to the action of erosive agencies whether aqueous or eolian.

As a whole, the work constitutes an excellent preliminary investigation of the evolution to the present stage of aridity of a region which was once exceedingly well-watered. The study of its physiography has placed a powerful tool in the author's hands for the deciphering of this gradual change. The evidence of former active fluvial erosion are the presence of wide valleys and isolated buttes, as on the Adar-Doutchi plateau. Aside from the decrease in the amount of atmospheric precipitation, this aridity of quite recent times is generally ascribed by Dr. Garde to the gradual dissolution of a ferruginous sandstone capping, remnants of which still form the uppermost layers of the resisting lumps of the dissected plateau.

The stratigraphic investigation led to simple conclusions. A basal crystalline band underlies the region. Above it rest detrital accumulations of a sandy-argillaceous character which sometimes attain thicknesses of over 100 meters. Fossiliferous limestones were found to be intercalated with the latter. The most important results in this field appear to be the discovery of a petrographic province characterized by the presence of alkaline rocks in which strong evidence of consanguinity to the igneous rocks of the Sudan region was revealed.

The main physical features of the lake Chad basin are clearly set forth. The lake is described as the remnant of a former extensive sheet of water. The evidence brought forward is not very conclusive, however. No mention is made of earlier shorelines illustrating former levels. On the other hand the presence of lacustrine deposits was recognized. The author insists on lake Chad being an independent outlet for the basin's watercourses. As a corollary to this assertion the existence of the lake is assumed to continue as long as it will be fed by this supply, of which the Shari river contributes a notable proportion.

The petrographic notes tend to show that the igneous rocks of the region are all products of a single magma. They are all siliceous. Students of African geology will find a comprehensive bibliography referring more especially to the region examined by the author, inserted at the very beginning of the work.

LEON DOMINIAN.

**The Natives of Kharga Oasis, Egypt.** By Aleš Hrdlička. vi and 118 pp. Ills.]] *Smithsonian Miscell. Collections*, Vol. 59, No. 1, Washington, 1912.

In cooperation with the important work of archaeological research conducted by the Metropolitan Museum in the Nile Valley, the Smithsonian Institution commissioned Dr. Hrdlička to undertake the anthropological examination of the population of the Kharga Oasis. It is an obscure abode of men of scant moment in the great march of history which has swept for ages up and down the great valley of the Nile. Set apart by arid stretches of sand from the great civilizing movements this cluster of mankind has undergone the minimum of change. It has no history, for it has lived unnoticed, its poverty has attracted no conqueror and its only modifiers have come from the zeal of religious movements. All the record of the past takes up no more than a half dozen introductory pages of this monograph. Little more space is needed for the record of the present social condition of the oasis, a speck of fertile land where for immemorial centuries nothing has ever happened so continuously as to establish the rule that nothing happens now.

It is primitive soil for the operations of physical anthropology, Dr. Hrdlička has reaped it most closely up to the point where religious convention put a stop to his investigation. The Oriental tabu of women has prevented the extension of his studies on the distaff side. Within the area thus left open to him the author's observations have been singularly complete. In table massed upon table he gives us the most extensive record of the physical measurements of the Kharga men. Nor does this by any means complete his idea of what such work should be. Each of the critical indices of measurement is discussed independently, and where the author establishes comparison with neighbor folk the result is always most enlightening. This monograph is most earnestly to be commended to anthropologists as setting a model for the presentation of the results of such study.

WILLIAM CHURCHILL.

## ASIA

**Biblical Geography and History.** By Charles Foster Kent. xviii and 296 pp. Maps, index. Charles Scribner's Sons, New York, 1911. \$1.50. 7½ x 5.

Professor Kent's book on Palestine is a good illustration of the fact that geography, in the broader sense, is still in its early youth. It is written in a clear simple style, the arrangement and proportion of parts are admirable, and the book as a whole gives the reader a clear conception of many of the most important ways in which the physical form of Palestine has influenced its history. Nevertheless the modern geographer reads it with the feeling that from the standpoint of the latest developments in his science it is lacking in certain important respects. Journalists, statesmen, theologians, soldiers and men of various other professions write books on geography, and often succeed in producing work of genuine value. In the present stage of his science, the geographer welcomes such volumes, yet he regrets that they are almost sure to be largely empirical.

The work under review falls into the class of the better geographical works written by men who make no claim to be geographical specialists. The first seventy pages are devoted to a painstaking and minute description of the location, boundaries and general appearance of each of the main divisions of Palestine, but in no case is any use made of the modern science of physiography and its nomenclature. The chapter on Jerusalem is one of the best in the book, since more than almost any other it presents a concrete case of cause and effect. The next section is a chapter devoted to the interesting subject of the highways of

the Biblical world. The mere statement of the location and nature of the highways occupies most of the space that can be devoted to this subject, leaving little opportunity for specific illustration of the effect of individual lines of communication upon the people.

The remainder of the volume is devoted to what is commonly called historical geography. Assuming that the reader possesses a somewhat intimate knowledge of Hebrew history, the author proceeds to a detailed discussion of where each particular event took place. Much space is given to the identification of sites and the determination of the routes followed by the migrating tribes, invading armies and individual travelers of the Biblical narratives. Battles and their relation to topography are discussed in detail.

Professor Kent's volume is not adapted to rapid reading, since it contains a great number of details which cannot be remembered unless read slowly. Nor is it designed to illustrate geographical principles, or to set forth new facts. It is primarily a book of reference for the Biblical student desirous of obtaining information upon particular events. As such it is most valuable, for its convenient size and careful arrangement under paragraph headings, agree with its pleasant style in making it easy to use.

ELLSWORTH HUNTINGTON.

**Bibelatlas in 20 Haupt- und 28 Nebenkarten.** Von Hermann Guthe.

Mit einem Verzeichnis der alten und neuen Ortsnamen. H. Wagner & E. Debes, Leipzig, 1911. Mk. 12. 17½ x 12.

The author is admirably fitted as a biblical historian and archaeologist for the important task which he has here undertaken. He has also utilized the results of the explorations of Dr. Schumacher and Prof. Brünnow east of the Jordan, and especially those of Prof. Musil in hitherto unexplored territory lying to the south of Palestine. The new English map of the Sinaitic Peninsula has also made it possible to substitute scientific facts for the conjectures which have hitherto prevailed regarding much of this region. Biblical geography is here defined broadly so as to include not only Syria, Babylonia, and Egypt, but also practically all of the lands mentioned in the biblical narrative.

The series of historical maps cover a period of a millenium and a half, beginning with 1400 B. C. A valuable map of modern Palestine is also added. A good topographical map, however, would have greatly enhanced the value of the series. Of more doubtful value is Plate 6, in which the practically impossible attempt is made to identify all the places and races named in Genesis Chapter 10. It suggests, however, the geographical outlook of the Hebrews at the two periods represented by the early prophetic and the late priestly documents. The color scheme adopted is, in general, excellent. The tendency, frequently observable in German-made maps, to introduce vivid and often inharmonious colors has been avoided, except in Plates 2 and 19.

An excellent reserve is also manifest in tabulating doubtful identifications. The identification of Capernaum with the site at Tel Hum is beyond reasonable doubt. The identification of Adullam, David's place of refuge during his outlaw period, with Tel-el-Mije is so well-assured that the question mark might well have been omitted. On Plate 2, Jabesh in Gilead is placed with a question mark on Wady Jabis, in the western headlands of Moab near the Jordan, while in Plate 3 it appears nearly in the heart of upper Gilead, and north of Mahne. The series, however, is remarkably free from this type of error. Tirzah, the temporary capital of northern Israel, is left unidentified, although its site is represented beyond reasonable doubt by the mounds north of Ain Farah. This compendious and carefully prepared atlas is well adapted to the needs of historical and theological students.

CHARLES F. KENT.

**China, Social and Economic Conditions.** iv and 187 pp. Index. *Annals of Amer. Acad of Political and Social Science*, Vol. 39, Jan., 1912. Philadelphia. \$1. 10 x 6½.

The Academy has pursued its wonted careful method in the preparation of this brochure, whose importance is by no means suggested in its painfully quiet



exterior. We have here sixteen able essays on as many themes of permanent interest in Chinese life. The authors, so far as their names are known in Occidental life, are recognized in their several specialities as those who may properly speak with authority. Not the least interest will attach to five papers by as many Chinese, each developed by our university system. It is quite clear that here we have the fresh voice of new China; and it is equally clear that these progressives intend to proceed with the most earnest conservation of that solid, moral nature which has kept China a nation during all the ages when barbarians have come into gilded empires and have crumbled into nothingness while China has been China throughout.

WILLIAM CHURCHILL.

**The Chinese at Home or the Man of Tong and His Land.** By J.

Dyer Ball. xii and 370 pp. Ills., index. Fleming H. Revell Co., New York, 1912. \$2. 8½ x 5½.

**China in Transformation.** By Archibald R. Colquhoun. Revised and enlarged. vi and 298 pp. Maps. Harper & Brothers, New York, 1912. \$1.50. 8 x 5½.

It was quite naturally to be expected that the movement of events in the Middle Kingdom should lead to the manufacture of many books on China. It has acquired a timeliness of news value, and publishers of books are just as subject to the influence of news as are the editors of the periodical press. The two volumes here joined for notice are essentially the result of this motive. Mr. Colquhoun's book has been on the market before; this is the old material brought up to date. From motives of book manufacture this has been somewhat hurriedly done, but for the most part the new material has been cleverly dovetailed into the old, as was to be expected of a writer with this author's facility. A more serious complaint is that the new material is not conclusive; yet it would be too much to expect to find a statement of conclusions when the events of new China are yet far from any conclusion.

A quality of Mr. Ball's book is established by himself in a succession of chapter headings, no less than sixteen of twenty-seven chapters involve the use of the designation "John Chinaman." This is not intended to be insulting; one feels rather that the author is trying to show himself cordial, and he tries to feel in sympathy with the Chinese. After all he has spent years in China, he knows Chinamen and in his clumsy way he likes them. But he is wholly lacking in the feeling of respect which China must deserve from thinking men and students of the philosophy of civilization, and his record, while entertaining and at times instructive, deals most largely with the trivial things of life rather because they amuse, since they are not Occidental, than because of any thought that even in these trivial things inspired research might find matter of great moment.

WILLIAM CHURCHILL.

**Durch Armenien, eine Wanderung, und der Zug Xenophons bis zum Schwarzen Meere, eine Militär-Geographische Studie.** Von E. v.

Hoffmeister. viii and 252 pp. Ills., maps. B. G. Teubner, Leipzig, 1911. Mk. 8. 10 x 7.

Earlier books have shown Gen. von Hoffmeister a most enthusiastic wanderer, keen in his interest at every step of the way, filled with the happy confidence that what has attracted his attention will serve to stimulate the pleasure of his reader. Armenia, with its ancient culture, is no longer the field for the pathfinder and the pathmaker. What we ask now of each new visitor to the mountain empire is that he shall pick up wayside detail with which we shall add intimacy to the basic knowledge we already possess. That is the scope of Gen. von Hoffmeister's very readable account of his trip through Armenia. So much for the former two-thirds of the volume, a chatty narrative of surface observation, abundantly illustrated with excellent half-tone pictures.

Then comes matter of another sort, the final third of the volume, not a picture to break its pages, the serious style, a monograph of worthy research on the retreat of the Ten Thousand, Xenophon's less known "Katabasis." This is

a review by the trained military intelligence of a problem wholly military. Following the route of the Greek mercenaries after the defeat of Cyrus this lieutenant general of the armies of a great empire has made a close examination of the logistics of that wonderful retreat. He is sympathetic with the problems of the morale of condottieri under defeat, and his study of the rise of Xenophon from the position of a cadet volunteer to the iron command of a mob from which discipline had departed is one of the most brilliant comments which we have read upon this incident of history. The Anabasis, unfortunately, has been given over to kindergarten Greek in our scheme of education. This monograph by Gen. von Hoffmeister should serve to remind us that Xenophon wrote one of the great texts of the art of war, one that should carry lessons of particular value to such political units as the English speaking countries where reliance for defence is placed upon the levies of volunteers lacking in that morale which makes the smaller body of seasoned troops far more effective.

WILLIAM CHURCHILL.

### **AUSTRALASIA AND POLYNESIA**

**Ein Beitrag zur Kenntnis der Tuamotu-Inseln.** Von Dr. Georg Friederici. 80 pp. Maps, ills. Leipzig, 1911.

This modest but highly valuable paper is one of the progress reports of the Hanseatische Südsee Expedition of 1909. The author has already published a brief yet interesting account of the Beach-la-mar jargon of the western Pacific. He promises without delay a more general report upon that region. The object of the expedition was the commercial exploitation of these undeveloped islands of the remote sea, an excellent example of the correlation of geographical science and business concerns.

In this volume the author records in detail his observations in the Tuamotu Archipelago, thus preserving the vivid value of field notes of a reconnaissance report; and at the end he sums up in broader conspectus his determinations as to certain problems of geotectonics and ethnology which have hitherto been but imperfectly examined. It will be found of advantage to list the particular atolls upon which his investigations were conducted. These are: Anaa, Haraiki, Makatea, Manuhangi, Maria, Mururoa, Niau, Reitoru, Taiaro, Tematangi, and Tikei.

It is very interesting to note that Dr. Friederici studied the atoll formation in the light of the researches of Darwin and Dana. His notes show that in several important particulars he was unable to reconcile matters of his own observation with either of these theories of explanation. Upon his return within the reach of library facilities he found the more recent studies of Agassiz and is led to give his adhesion most consistently to the work of this later student, though he is obliged to record that it does not completely explain all the observed conditions.

The question of geographical nomenclature has received careful attention in connection with each of the eleven atolls visited. He settles priority of discovery and deals intelligently with the disputed identification of the Sagittaria of Quiros. It is clear that this cannot be Tahiti. It is equally clear that it is not to be confounded with the Conversion de San Pablo of the same mariner, and that the latter is most probably Anaa. Dr. Friederici seems not to have ascertained one most interesting fact which bears with great force upon the discoverability of this atoll. It lies upon the sea with scarcely more elevation than driftwood, in fact on near approach to its reef the land is hidden behind the waves of its breakers; yet, through a rare physical combination of the "atoll cloud" and the reflection from the lagoon water, Anaa affords to the navigator a sky mark as effective as would be the case were the island a mile or more in height.

In discussing the questions of the ethnology of the archipelago the author calls particular attention to the fact that there is a double mixture. A part of the group has strong affiliations with Tahiti, the southern part is affiliated with Mangareva. In this Dr. Friederici anticipates the conclusions which with greater opportunity for detailed statement I am now elaborating in the study

of the philological problems of this province of Southeast Polynesia. His treatment of the problem of Melanesian traces in the Tuamotu is both simple and convincing. Altogether, this little volume is the most valuable of all the works dealing with this ultimate attainment of the great migration movement of the Polynesian race.

WILLIAM CHURCHILL.

### EUROPE

**Transportation in Europe.** By Logan G. McPherson. vi and 285 pp. Map.

Henry Holt & Co., New York, 1910. \$1.50. 7½ x 5.

During recent years the author has published two informing books on "The Working of the Railroads," and "Railroad Freight Rates." In the same clear, forceful style he here presents the salient facts concerning the transportation systems of Europe.

In his introduction he points out that the United States should be compared with all Europe, and not with single countries; that our need for railroads is much greater than Europe's because of our lack of peninsulas and inland seas and of improved inland waterways; and that our industrial status is such as to encourage great transportation enterprises.

Two chapters recount the history, cost of construction, and maintenance, ownership and administration of the roads, canals and railroads of Europe, country by country. The occurrence of three or four classes of passenger rates is explained as a consequence of social classes and not an adjustment to purses. The chapter on "International Rail Traffic" shows how traffic and rates have been adjusted to physical and political barriers. In this chapter, as in others, comparisons with American conditions add greatly to the comprehension of the problems.

Discussing the comparative usefulness of inland waterways and railroads, the author says the waterways have not increased in mileage in thirty years, while the railroads have about doubled. Railroads can operate all the year; waterways are inactive in frozen winter and in dry summer. Railroads pay heavy taxes to the governments and supply millions of dollars worth of free transporting for them; water craft pay small tolls on artificial waterways, but nothing on natural routes, and they never render any government aid. Railroads are limited in their rates for traffic, but water craft may charge what the traffic will bear. The government favors the waterways. In spite of all these advantages, waterways and water craft are continually losing ground in Europe. All concede that European railroad traffic is not so good as American. A long closing chapter is devoted to transportation in England. G. D. HUBBARD.

**Géologie du Bassin de Paris.** Par Paul Lemoine. ii and 408 pp. Maps, ill., bibl., index. A. Hermann & Fils, Paris, 1911. 15 frs. 10½ x 7.

The Basin of Paris is classic ground in geology, because it is the first region of Europe which underwent scientific examination through such scholars as Alexander Brogniart, Cuvier, Lamarck and Deshayes. While the first named examined the ground geologically, Cuvier, Lamarck and Deshayes made the first researches of the vertebrate remains and of the moluscan fauna of the territory. The basin is a syncline, in which, after the Triassic period sedimentation set in and continued to the Tertiary. The latter is characterized by three stages: Bartonien (upper Eocene), Lutétien (middle Eocene) and Yprésien (lower Eocene). The formations consist of fossiliferous sands, sandstones and limestone. The gypsum of Montmartre formerly classified in the upper Eocene, is now referred to the Oligocene. The shales above the gypsum with *Linnaeus strigasus*, the so-called *Marnes supragypseuses*, as well as the Cyrene-marls with *Cyr. convexa*, *Cerith. plicatum*, etc., and the fresh-water lime of the Brie with *Planorbis*, *Linnaeus*, etc., are now placed in the lower Oligocene.

Beginning in middle Oligocene time, the Paris Basin was again overflowed by the sea, which extended in that period even farther south than during the Eocene. Near Paris the so-called "oyster shales" ("*marnes à huîtres*") were formed, with *Ostrea cyathula*, etc. To the upper Oligocene finally belong the

millstone ("meulières") of Villers-Catterets, Montmorency, etc., and the lime of the Beauce, both fresh water formations, with numerous species of *Linnaeus*, *Planorbis*, *Paludina*, etc., and remains of *Anthracotherium*, *Aceratherium*, etc. The remains of *Palaeotherium magnum* and *medium*, *Anaplotherium commune*, *Xiphodon*, etc., first described by Cuvier, are, however, found in the main strata of the Paris gypsum.

The treatise by Lemoine gives a complete history of the Paris Basin, geologically as well as paleontologically. A general introduction will help those who are not familiar with the technical terms to understand the larger part of the rocks. Numerous illustrations and maps elucidate the text.

CHARLES L. HENNING.

## OTHER BOOKS RECEIVED

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RECOLLECTIONS OF ELIZABETH BENTON FRÉMONT, daughter of the Pathfinder General John C. Frémont and Jesse Benton Frémont his wife. Compiled by I. T. Martin. 184 pp. Ills. Frederick H. Hitchcock, New York, 1912. \$1.25. 7½ x 5. [Reminiscences which impart the human touch to many of the important events that occurred between the Atlantic and Pacific Seaboards during the latter half of the Nineteenth century.]

MAMMOTH CAVE OF KENTUCKY. With an Account of the Colossal Cavern. Revised Edition. By Horace Carter Hovey. iv and 131 pp. Maps, ills. John P. Morton & Co., Louisville, 1912. \$1. 8½ x 6. [The standard history and description of Mammoth Cave.]

NEW ENGLAND AND ITS NEIGHBORS. By Clifton Johnson. xv and 335 pp. Ills. The Macmillan Co., New York, 1912. \$1.50. 7½ x 5½. [A study of the rural aspects of national life in the New England states, New York and Pennsylvania.]

WHITE MOUNTAIN TRAILS. Tales of the Trails to the Summit of Mount Washington and other Summits of the White Hills. By Winthrop Packard. xiv and 311 pp. Ills., index. Small, Maynard & Co., Boston, 1912. 8½ x 6. [A delightful account of mountaineering in the East. Abounds in charming descriptions.]

### WEST INDIES

Memoria de la Administración del Presidente de la República de Cuba Mayor General José Miguel Gómez. Durante el Periodo Comprendido entre el 1° de Enero y el 31 de Diciembre de 1910. 501 pp. Maps, ills. Secretaria de Estado, Havana, 1911. 9½ x 6½. [A systematic account of Cuban progress during 1910.]

### SOUTH AMERICA

THE INDEPENDENCE OF CHILE. By A. Stuart M. Chisholm. 330 pp. Sherman, French & Co., Boston, 1911. \$1.50. 8½ x 5½. [A record of the Spanish Colony and the events that led to its independence.]

### AFRICA

EGYPT. As Described by Great Writers. Collected and edited by Esther Singleton. xii and 357 pp. Ills. Dodd, Mead & Co., New York, 1911. \$1.60. 8½ x 5½. [These sketches give an excellent idea of present day Egypt and its inhabitants. The ever recurring contrast between the Old and New is well set forth. The selections are all from the writings of notable observers.]

NATAL PROVINCE. Descriptive Guide and Official Hand-Book. Edited by A. H. Tatlow. xi and 574 pp. Maps, ills., index. South African Railways Printing Works, Durban, Natal, 1911. 7s. 6d. 10½ x 7½. [A good account of present day Natal preceded by a short historical sketch.]

## ASIA

LA CINA CONTEMPORANEA. Viaggio e Note di Giuseppe de' Luigi. 290 pp. Maps, ills. Fratelli Treves, Milano, 1912. 10 x 6½. [A lively account of China in the throes of its attempt towards modernization.]

## AUSTRALASIA

HISTORY OF AUSTRALASIA. From the Earliest Times to the Present Day with a chapter on Australian Literature. By Arthur W. Jose. 4th edition, revised and enlarged. xiv and 319 pp. Ills., index. Angus & Robertson, Ltd., Sydney, 1911. 3s. 6d. 7½ x 5½. [A concise account of the growth of the early settlements to their present day stage.]

## EUROPE

THE GREEK COMMONWEALTH. Politics and Economics in Fifth-Century Athens. By Alfred E. Zimmern. 454 pp. Maps, index. Clarendon Press, Oxford, 1911. \$3.40. 9 x 6. [A sound exposition of the economic factors which influenced certain phases of Athenian history.]

IN THE CARPATHIANS. By Lion Phillimore. 348 pp. Map, ills. Henry Holt & Co., New York, 1912. 9 x 6. [A brightly written narrative of travel among the Slavs of Central Europe. Individual types of Austria's heterogeneous population are well described.]

## ANTHROPOLOGY

THE GOLDEN BOUGH. A Study in Magic and Religion. By J. G. Frazer. 3d Edition. Part V: Spirits of the Corn and of the Wild. Vol. 1, xvii and 319 pp. Vol. 2, xii and 371 pp. Index. Macmillan & Co., Ltd., London, 1912. 20s. each. 9 x 6 each. [A review of this notable work appeared in the *Bulletin*, Vol. 44, 1912, No. 7, pp. 543-545.]

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THE REPRESENTATION OF RELIEF ON MAPS. By Capt. H. G. Lyons. Technical Lecture No. 2, 1908-9. Delivered Dec. 23, 1908. 19 pp. Maps. Survey Dept., Ministry of Finance, Egypt, Cairo, 1909. [Discusses contour, shading and color methods.]

OIL-FINDING. An Introduction to the Geological Study of Petroleum. By E. H. Cunningham Craig. With an Introduction by Sir Boverton Redwood. x and 195 pp. Index, ills. Longmans, Green & Co., New York, 1912. \$2.40. 9 x 6. [Deals with the subject of prospecting for oil. Contains notes of value to the field-geologist.]

DIE HAUPTSPRACHEN UNSERER ZEIT. Mit einer Einleitung: "Die wichtigsten Sprachen der Vergangenheit" sowie mit zahlreichen Schrift- und Sprachproben und einer Sprachkarte. Von Dr. Ludwig Harald Schütz. ix and 226 pp. Index. J. St. Goar, Frankfurt am Main, 1910. Mk. 6. 10 x 6½. [A brief, eclectic exposition of the genius of the most important languages spoken.]

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NEGRO YEAR BOOK AND ANNUAL ENCYCLOPEDIA OF THE NEGRO, 1912. 215 pp. Tuskegee Normal and Industrial Institute, Alabama. [Contains statistical data on the negro as well as a résumé of the race's activities in various fields.]

THE WHOLE ART OF RUBBER-GROWING. By W. Wicherley. 154 pp. Ills. J. B. Lippincott Co., Philadelphia, 1911. \$1.50. 7½ x 5. [A short treatise on the planting and exploitation of those species of rubber-yielding trees which lend themselves to successful alienation.]

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## NEW MAPS\*

### MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

#### U. S. GEOLOGICAL SURVEY

NORTH AMERICA. Map of North America. 1:10,000,000. 84°-6° N.; 180°-10° W. With two insets: (1) [Aleutian Islands] 55°48'-50° N.; 172° E. 162°36' W. (2) [Windward Islands] 19°-8° N.; 67°-59° W. 1912. [A useful base map reduced from the 1:5,000,000 map compiled by the same bureau. State and international boundaries shown. - Extreme northeastern coast-line of Greenland omitted.]

#### Maps Accompanying Publications

MAINE. Map of Maine showing Penobscot Drainage Basin. 1:1,000,000. 47°30'-43° N.; 71°18'-66°42' W. 4 symbols. Accompanies, facing p. 8, "Water Resources of the Penobscot River Basin, Me." by H. K. Barrows and C. C. Babb. Water-Supply Paper 279. 1912. [Shows drainage boundaries with river and lake surveys.]

MONTANA. (a) Geologic Map of Region surrounding the Butte District. 1:250,000. 46°37'-45°45' N.; 112°42'-111°56' W. 13 colors. 1912. (b) Geologic and Vein Map of Butte, Montana. 1:15,000. 46°02'54"-45°59'28" N.; 112°36'42"-112°29'30" W. 7 colors. 1912. Pls. I-X, "Geology and Ore Deposits of Butte District, Montana," by W. H. Weed. *Prof. Paper* No. 74, 1912.

UTAH. (a) Topographic Map of Park City District, Utah, with index showing position of mines. 1:25,000. 40°39'-40°35' N.; 111°34'-111°26' W. (b) Geologic Map of the Park City District, Utah. 1:25,000. 40°39'-40°35' N.; 111°34'-111°26' W. 16 colors. (c) Geologic Map of Central portion of Park City District, Utah. 1:12,000. 40°38'-40°36'30" N.; 111°31'30"-111°29'30" W. 13 colors. Pls. I-XXXIX "Geology and Ore Deposits of the Park City District, Utah," by John Mason Boutwell, *Prof. Paper* No. 77. 1912.

#### U. S. COAST AND GEODETIC SURVEY

##### Atlantic Coast

Cape Neddick Harbor to York River, Maine. 1:20,000. 43°11'42"-43°07'00" N.; 70°39'48"-70°34'00" W. Chart No. 228. May 1912. 25 cts.

##### Gulf Coast

Sand Key to Rebecca Shoal. 1:80,000. 24°50'-24°17' N.; 82°40'-81°52' W. Chart No. 1252. July 1912. 50 cts.

##### Pacific Coast

San Francisco to Point Arena, California. [Mercator's projection: mean meridional scale 1:200,000.] 38°59'-37°32' N.; 124°35'-122°13' W. Chart No. 5502. June 1912. 50 cts.

#### GENERAL LAND OFFICE

UNITED STATES. [4 State maps, 1:760,320, viz:] (a) State of Florida. 1911. (b) State of Illinois. 1911. (c) State of Missouri. 1911. (d) State

\* Prepared by L. Dominian in the absence of the Assistant Editor.

of New Mexico. 1912. [These standard maps belong to the series of public-lands state-maps compiled from the official records of the G. L. O. Land District Boundaries, Forests, Indian and Military reserves, etc., shown. Relief in brown shading.]

#### NORTH AMERICA

**NORTH AMERICA.** Stanford's Library Map of North America. In 4 sheets. 1:5,274,720. 18 colors. With one inset: Aleutian Islands and continuation of Alaska Peninsula. 1:5,274,720. 58° - 50° N.; 178° 30' - 159° W. 1 color. E. Stanford. London. 1912. Price 35 sh. [An up-to-date edition of this general reference map. Canadian provincial boundaries with changes in Manitoba and Quebec shown. Also state lines in the United States and Mexico. Barring representation of land relief, the execution is good.]

**UNITED STATES—MEXICO.** Map of Southwestern Arizona and Northwestern Sonora, comprising the region formerly called Papagueria. 1:754,000. 33° 24' - 29° 18' N.; 115° 12' - 110° 36' W. 2 colors. With two insets: (a) The Pinacate Region. 1:50,700. 31° 45' N.; 113° 30' W. (b) Sketch map of the United States and Mexico [showing location of main map]. Accompanies "New Trails in Mexico" by C. Lumboltz. Charles Scribner's Sons, New York, 1912. [Important revision of this region based on the author's original surveys. Trails, wells and villages indicated. Course of Sonoita river located farther south than on other maps. Extreme N. E. coast-line of the Gulf of California redrawn. Indentations on northern shore of Bahia de Adair mapped. Native names of the ranges trending N-S given. Area covered by sand dunes south of Yuma desert shown. Notes on the vegetation of the northern section of the Altar district inserted locally.]

#### CANADA

**ALBERTA.** [2 maps showing disposition of lands, 1:792,000, viz:] (a) Northern Alberta. 60° 12' - 52° 55' N.; 121° - 110° 50' W. 10 colors and 2 symbols. With one inset. [Peace River Block.] 1:792,000. 56° 42' - 55° 30' N.; 122° - 120° 12' W. 1 color. (b) Alberta, Southern. 55° 25' - 48° 50' N.; 119° 36' - 109° 20' W. 9 colors and 3 symbols. Railway Lands Branch, Dept. of the Interior, Ottawa. 1912.

**BRITISH COLUMBIA.** Map of Vancouver Island and adjacent Islands. 1:253,440. 51° - 48° N.; 129° 12' - 122° W. 2 colors. T. N. Hibben & Co. Victoria, B. C. 1910. [A valuable land map. Timber and coal licenses shown. Also lots, sections, blocks, Indian Reserves, etc.]

#### MEXICO

**CHIHUAHUA.** Map of the State of Chihuahua. 1:1,000,000. 32° 26' - 24° 36' N.; 109° 30' - 102° 30' W. 1 color. H. A. Horsfall, New York. 1911. Price \$5.00. [Map based on private surveys made by engineers. Valuable as regards wagon roads and trails. Mining districts shown.]

#### CENTRAL AMERICA

**CENTRAL AMERICA.** Mapa de America Central. 1:1,000,000. 17° 50' - 7° N.; 92° 30' - 79° 20' W. 13 symbols. With one inset: Map of Canal Zone, 1:250,000. W. C. Rübsamen, Stuttgart. [1911.] Price \$10. [A well-executed wall-map of this region. Compiled from U. S. and C. A. government maps. Relief in two shades of brown for elevation above and below 100 mts. Heights in meters. International boundaries shown as contended or definite. Also administrative subdivisions. Thorough as regards roads and railroads. Coast-line accurate but some river courses will need revision as surveys are advanced. Steamship connections and wireless stations indicated, as well as location of mining districts. Text in English and Spanish. Accompanied by explanatory pamphlet in English, Spanish, German and French.]

**COSTA RICA.** Mapa de Costa Rica. 1:500,000. 12° 40' - 8° N.; 86° - 83° 46' W. 10 colors and 15 symbols. With one inset: [Coco Island 1:500,000] 5° 30' N.; 87° W. 5 colors. Taf. I. "Kostarica, Beitrage zur Orographie

und Hydrographie," by H. F. Pittier *Ergänzungsheft* No. 175 zu *Pet. Mitt.* 1912. [Primarily a physical map compiled from foreign and national official data. Hypsometry shown by contours at irregular intervals and 10 shades of brown. Altitude in meters. Railroad lines divided in unit spaces of 1 km. Roads and new trails plotted. Panama boundary line indicated both where definitely settled and contended.]

## SOUTH AMERICA

**SURINAM.** Suriname. De Corantijn. 1:500,000.  $5^{\circ}5' - 1^{\circ}45' N.$ ;  $58^{\circ}5' - 56^{\circ} W.$  2 colors and 6 symbols. With one inset: Overzichtskaarte van Suriname. 1:3,000,000.  $6^{\circ} - 1^{\circ}40' N.$ ;  $58^{\circ}10' - 53^{\circ}40' W.$  2 colors. Kaart III "Verslag der Corantijn Expeditie (19 Juli 1910-1 April 1911)" by C. C. Kayser. *Tijds. van het K. N. Aardrijks. Gen.* Vol. XXIX, No. 4, July 15, 1912. pp. 442-515. [Shows expedition's route in this ill-known region. New latitude and longitude determinations and barometric heights. Native trails in blue. Party's route in red. Relief in brown hachures. Same color shading when height determinations insufficient.]

**PERU.** Railway and Mining Map of Peru. 1:6,000,000.  $1^{\circ} - 19^{\circ} S.$ ;  $82^{\circ} - 67^{\circ} W.$  13 symbols. Supplement, facing p. 85, "Peru To-day" Vol. IV, No. 2, May 1912. [Sketch map showing distribution of mineral deposits and railways operated, in construction, surveyed or proposed.]

**BOLIVIA.** Mapa demostrativo del desarrollo de los Ferrocarriles en Bolivia. 1:5,000,000.  $9^{\circ}30' - 25^{\circ}30' S.$ ;  $72^{\circ}30' - 57^{\circ} W.$  5 symbols. Accompanies, facing inside rear cover, *Boletín de la Oficina Nacional de Estadística* Nos. 70, 71 y 72, 1911. La Paz. 1912. [Sketch-map showing railroads in operation, in construction, surveyed and projected. With statistical data on distances.]

## AFRICA

**FRENCH WESTERN AFRICA.** Carte du Ouadaï. 1:1,000,000.  $15^{\circ}50' - 10^{\circ}50' N.$ ;  $18^{\circ}58' - 23^{\circ}25' E.$  With one inset showing location of main map. *Serv. Géogr. des Col.*, Paris. 1911. [Preliminary orography with approximate contours. Swamps and wells shown.]

**BASUTOLAND.** Basutoland 1:250,000. In 4 sheets. 2 colors and 29 symbols. (1) N. W. Sheet.  $28^{\circ}30' - 29^{\circ}35' S.$ ;  $27^{\circ} - 28^{\circ}15' E.$  (2) S. W. Sheet.  $29^{\circ}35' - 30^{\circ}40' S.$ ;  $27^{\circ} - 28^{\circ}15' E.$  (3) N. E. Sheet.  $28^{\circ}30' - 29^{\circ}35' S.$ ;  $28^{\circ}15' - 29^{\circ}30' E.$  (4) S. E. Sheet.  $29^{\circ}35' - 30^{\circ}40' S.$ ;  $28^{\circ}15' - 29^{\circ}30' E.$  *Geogr. Sec. of the Gen. Staff, London.* 1911. [Abounds in topographic detail.]

## ASIA

**CHINA.** Production Map of China. 1:5,000,000.  $45^{\circ} - 17^{\circ}30' N.$ ;  $93^{\circ} - 125^{\circ} E.$  7 symbols. Accompanies, facing p. 59, "Returns of Trade and Trade Reports. 1911." China. The Maritime Customs. I. Stat. Ser. Nos. 3 and 4. Shanghai 1912. [Shows distribution of natural resources.]

**TURKEY IN ASIA.** Asia Minor. The Troad after Kiepert and Philippson with corrections by Walter Leaf. (a) 1:600,000.  $40^{\circ}31' - 39^{\circ}17' N.$ ;  $25^{\circ}53' - 27^{\circ}43' E.$  1 color. (2) 1:300,000.  $39^{\circ}55' - 39^{\circ}29' N.$ ;  $26^{\circ}46' - 27^{\circ}9' E.$  1 color. Accompanies "Notes on the Troad" by W. Leaf. *Geogr. Jour.* Vol. 40, No. 1, 1912, pp. 25-45. [Corrections in the topography of the region environing Mt. Ida.]

## AUSTRALASIA

**AUSTRALIA.** Rain map of Australia for the year 1910. [1:9,000,000.] 2 colors. [Central Weather Bureau, Melbourne] 1911.

**VICTORIA.** Average Rainfall Map and Isohyets of Victoria. [1:2,250,000.]  $33^{\circ}48' - 39^{\circ} S.$ ;  $141^{\circ} - 150^{\circ}15' E.$  8 colors. Central Weather Bureau, Melbourne.

## EUROPE

**GREAT BRITAIN.** Electric Railways of London. 1:15,840. 2 colors and 8 symbols. Cook & Hammond, London. [1912]. [The relation between the sub-

ject illustrated and the regional element is admirably set forth. Railways operated, in construction and authorized shown. Also those proposed for session 1912.]

FRANCE. Environs de Paris dans un rayon de 30 Kilomètres. 1:66,666. 49°5'15"-48°37'45" N.; 1°53'2"-2°46'22" E. 4 colors and 18 symbols. H. Barrère. Paris. 1911. [A detail map. Its accuracy insures its value as a guide map. Roads and paths, woods, hamlets, buildings, farms, forts, etc.]

RUMANIA. Planul Orasului Bucuresti. [1:10,000]. 2 colors. Socac & Co. Bucurest. 1911. Price 2.50 lei. [Usual type of city maps.]

### WORLD AND LARGER PARTS

WORLD. (a) Coaling Stations of the World. [1:48,000,000]. (b) Trade Routes and Distances by existing lines and by the Panama Canal. [1:38,000,000]. Accompany "Panama Canal Traffic and Tolls." Preliminary Statement by E. R. Johnson. U. S. Sen. Doc. 575. Gov. Prin. Off. Washington, D. C. 1912.

### ATLASES

ATLAS UNIVERSEL DE GÉOGRAPHIE. Ouvrage commencé par L. Vivien de St. Martin et continué par Fr. Schrader. 90 sheets. Librairie Hachette et Cie. 1912.

This Atlas is finally completed after a half century. It was begun about 1862 by St. Martin. Since 1880 the work has been carried on by Schrader. The period covering its publication is that in which scientific geography went through the formative stage. It was also an era of active exploration that yielded a rich harvest of data to the cartographer who was enabled thereby gradually to fill the blank spaces marking unknown regions. The 90 sheets show that the publishers have availed themselves to the fullest extent of the contributions to their work afforded by this twofold progress.

The sheets given to America have been based almost exclusively on surveys undertaken by Federal or State bureaus. For the United States and Canada the maps consulted practically cover the entire cartographic output of both governments since the organization of their respective topographic bureaus. The map of North America is a reduction of the various sheets that were prepared for this continent. The equidistant zenithal projection assuring a minimum of deformation in the change from the spherical to the plane surface was adopted.

Special attention was bestowed on the less known portions of Northern Africa. The map of Morocco, one of the sheets recently issued, is based on the second edition (1904) of M. R. de Flotte de Roquevaire's 1:1,000,000 map to which corrections suggested by Louis Gentil's surveys were added. The term Anti-Atlas was restricted to the southwesterly chain diverging from the main uplift at the Siruaa massif and extending to the Atlantic Coast near Cape Nun.

The northwestern coast line of Africa may have to be revised in the light of the astronomical and geodetic observations made by Lieut. Dyé and Messrs. Larras and Pobéguin subsequent to the French military intervention. The harbor of Mogador lies about 4 kms. further west than is shown, the correlated inland points being similarly affected. On the South African sheet the boundaries of the different colonies have been based on maps published by official surveys. Their location conforms with the text of the treaties and delimitation conventions.

Most of the Asiatic sheets are fortunately among the latest published. The one showing Tibet and N. E. India has been compiled primarily from the 1:253,440 Indian atlas and 1:1,000,000 map of India and adjacent countries. Russian military maps were also consulted. Information obtained by explorations in the first decade of the present century has also been incorporated.

A wide range of cartographic literature has also been used in the preparation of the map of China. To avoid overcrowding the terminal syllable of the names of Chinese towns used to indicate their size or rank has been omitted. Restitution of this suffix is rendered easy by observation of the type. The ending *Fu* is required at the end of names written in capitals. *Tcheou* or *Ting* is the terminal syllable of those in Roman type while names in italics should end with *Hien*.

Much praise is due the editors for the execution itself. The atlas takes a leading place among the best products of modern cartographic art. The fineness of line obtainable on copper plate engravings has permitted the introduction of details that could not otherwise have been denoted. At the same time there is no crowding of the sheets with information that is not required by the scale. The legibility of the text is occasionally blurred in regions of high uplift owing mainly to the omission of color. Aside from this, each sheet reveals to the trained eye the great care with which it has been prepared. The atlas is not merely intended for the layman's use. Its place is much rather in the scholar's library.

**PHILIPS' CHAMBER OF COMMERCE ATLAS.** A Graphic Survey of the World's Trade with a Commercial Compendium and Gazetteer Index. viii and 128 pp. 144 pp. George Philip & Son, Ltd., London, 1912. 6s. 10 x 7. [This atlas is a concise résumé of commercial geography. The general features of the world's trade, the markets of the world, the sources of supply of the principal commodities, and the world's natural resources are depicted. In addition it contains information on the chief articles of international commerce. These features should recommend the work for a business man's library.]

**RAND, McNALLY & Co.'s NEW IMPERIAL ATLAS OF THE WORLD.** 193 pp. Index. Rand, McNally & Co., New York, 1911. 14½ x 11½. [The new edition differs little from the preceding. There is room for much improvement in its execution. The work contains demographic information which renders it particularly valuable.]

**PRATT'S ROAD ATLAS OF ENGLAND AND WALES.** 106 pp. Anglo-American Oil Co., Ltd., London, 1912. 2s. 6d. 8½ x 5. [A good road map. Hypsometry differentiated by color. Heights of towns and highest points on roads shown. A number of road profiles given.]

**A NEW SCHOOL ATLAS OF MODERN HISTORY.** A series of 48 Plates, containing 120 Coloured Maps & Diagrams, with an Introduction illustrated by 29 Maps and Plans in black and white. By Ramsay Muir. xxiv and 48 pp. George Philip & Son, Ltd. London, 1911. 3s. 11 x 9. [A commendable feature is the emphasis placed on the physical basis of historical geography. In most cases relief and hydrography are shown along with historical features. The introduction contains a commentary for each map. The execution is particularly good as regards text which contains only names referring to the special features shown on each map.]

**A SCHOOL ATLAS OF ENGLISH HISTORY.** Edited by Samuel Rawson Gardiner. 88 pp. Index. Longmans, Green & Co., New York, 1910. 8½ x 7. [This Atlas may be used as a companion to the "Student's History of England." It covers the period intervening between Roman Britain about 400 A. D. and the Siege of Sevastapol. A number of battle-field sketches accompany the maps.]

**ATLAS CLASSIQUE. FRANCE AND COLONIES. CARTES GÉOLOGIQUES, PHYSIQUES, HYPOMÉTRIQUES ET POLITIQUES.** Par Schrader et Gallouédec. 29 maps and 19 notices. Deuxième Édition Revue. Hachette et Cie, Paris, 1912. Fr. 2.50. 13 x 9. [Specially intended to accompany courses in geography and history as taught in French "Lycées." The regional maps of France are based on the geological structure of the country. A short comment accompanying each map serves to emphasize regional influences on the life of man.]

**JUSTUS PERTHES' TASCHEN-ATLAS.** 49. Auflage. Vollständig neu bearbeitet von Hermann Habenicht. 24 kolorierte Karten in Kupferstich. Mit geographisch-statistischen Notizen. Von Hugo Wichmann. 80 pp. Justus Perthes, Gotha, 1912. Mk. 2.40. 7 x 4. [Contains 80 pages of geographic notes systematically presented. The 24 small maps constituting the atlas are of the usual high order of execution for which the publishers are famous.]

**PEIP'S TASCHENATLAS VON BERLIN UND WEITERER UMGEBUNG.** Vierte gänzlich umgearbeitete Auflage. xviii and 163 pp. Paasche & Luz, Stuttgart, 1912. Kk. 2.50. 7½ x 4½. [A handy guide to the environs of Berlin roughly in a radius of 50 kms. The excellence of the execution practically precludes the necessity of text. Descriptive notes of local interest accompany the large scale maps.]